OCTOBER, 1961

Plant Engineering®

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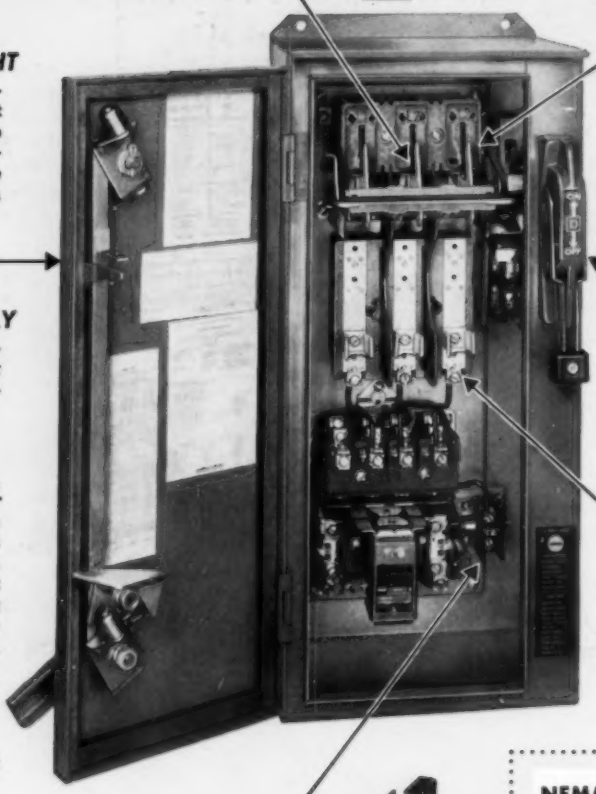

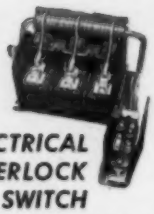

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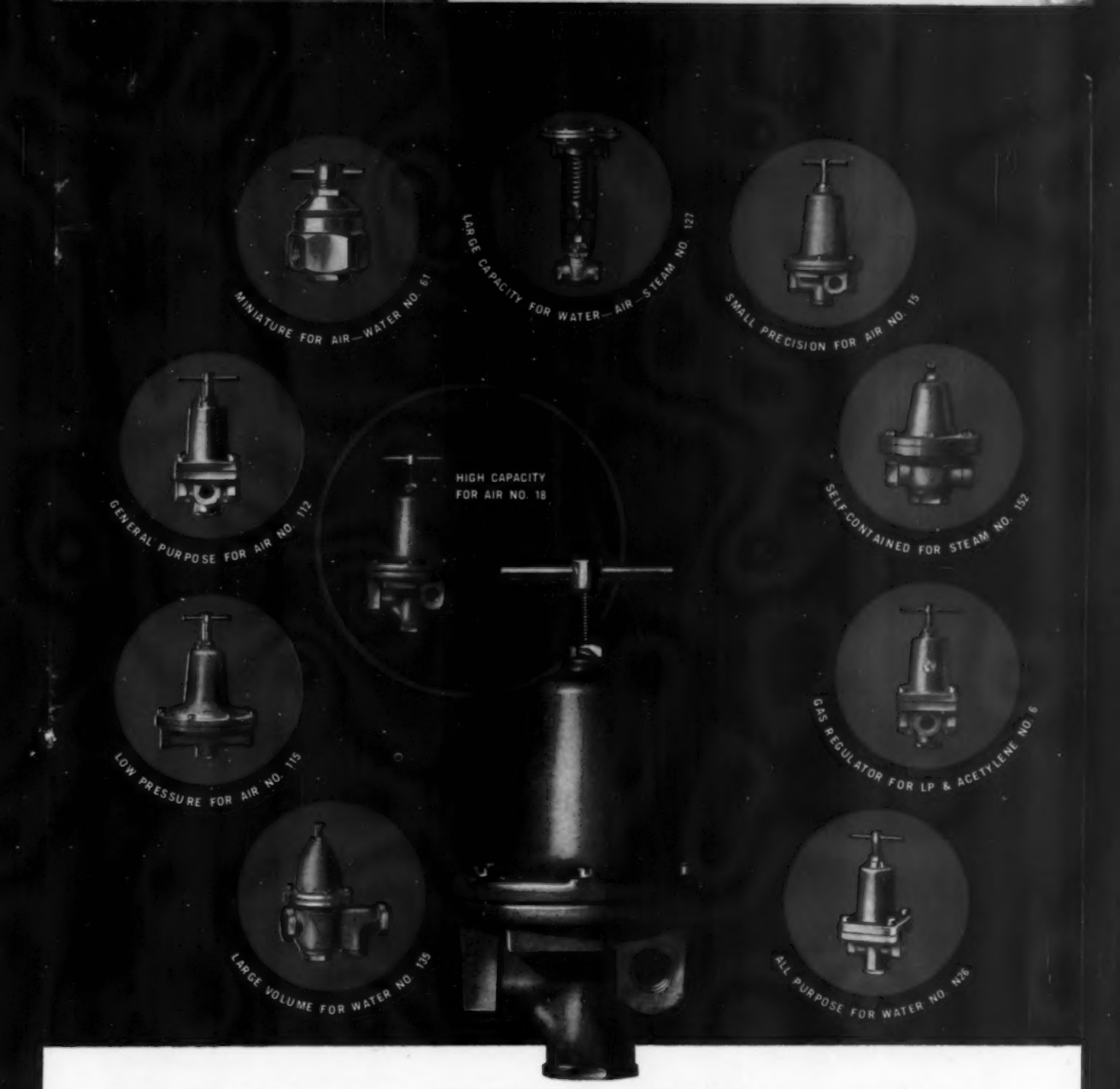
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'ROUND ABOUT with the editors

Edited by R. L. Marinello

Plant Engineering Changes

John F. Stevens has been promoted to plant engineer of Hamilton Standard, division of United Aircraft Corporation, Windsor Locks, Connecticut, succeeding **Frank E. Watts,** who retired recently.

Mr. Watts joined the company in 1940 and became plant engineer a year later. During his career, he directed the construction and equipping of four United Aircraft plant facilities. For the past two years, he supervised the construction of two new plants opened this year by Norden, a division of United Aircraft, at Norwalk, Conn., and Costa Mesa, California.

Mr. Stevens was assistant plant engineer for the past two years. A graduate of Aeronautical University, Chicago, he started with the company in 1950 as an equipment engineer. His other positions at the company include engineering supervisor, superintendent of inspection and project engineer.

Plant Engineering and Maintenance Conference-Show

PLANT ENGINEERS should mark the following dates—January 22, 23, 24 and 25—and the place—Convention Hall, Philadelphia—as the first important event in 1962. These are the dates of the Plant Engineering and Maintenance Show and Conference. The conference sessions will take place on January 22, 23 and 24.

Further details about the conference program being planned, along with specific titles of some of the papers to be presented and the names of the speakers, will appear in a later issue.

New Engineering Building Opens

MANY MEMBER societies of the Engineers Joint Council have moved into the new United Engineering Center Building at 345 East 47th St., New York City, just across from the United Nations Building. This new address will apply to all Engineers Joint Council activities including: the Engineering Manpower Commission; the Secretariat for IAESTE, the U.S. Committee for the International Exchange of Students for Technical Experience; the U.S. Committee of the World Power Conference; the U.S. Committee on Large Dams; Committee on International Relations; the UPADI Fund; and the National Engineers Register.

Josef Wischeidt, Jr., Secretary of the Committee on International Relations of Engineers Joint Council, recently visited Paris to discuss with the officers of UNESCO further cooperation with that organization. He is also Secretary of the IAESTE concerned with the exchange of students. He made an extensive tour of German industries in which American students are currently training. His purpose is to determine the reasons for the extensive participation of German industry in this exchange, with a view toward increasing U.S. participation.

Engineers' Income-Salary Survey

ENGINEERS' SALARIES are going up, according to a survey recently conducted among 24,326 engineers. Median income for those engineers responding to the survey reached a new high of $10,660. This is up 6.6 per cent from the survey taken in 1958.

Ninety per cent of the engineers surveyed received salary or income over $7140 in 1960, an increase of $100 over 1958. Three-fourths of those surveyed made in excess of $8580, up from $8250 in the previous survey. The top 25 per cent of those answering earned $13,750 or more, an increase from $13,620 in 1958. Only for the top per cent was the decile level unchanged, remaining at $19,680.

For all the facts and figures of the 1960 Professional Engineer's Income and Salary Survey, send your request for this booklet to National Society of Professional Engineers, 2029 K Street, N.W., Washington 6, D. C. Prices: NSPE members, $1.00 per copy; nonmembers, $2.00 per copy.

Joint Regional Meeting of AIPE Chapters

THE Skokie Valley Chapter of the American Institute of Plant Engineers will be host to this year's Region 3 dinner meeting. Other chapters in this region who will participate in the meeting are: Calumet Region, Central Indiana, Chicago, Fox Valley, Milwaukee, Northern Illinois, and the Twin City.

This yearly get-together of these chapters will be held at Di Leo's Restaurant, 5700 N. Central Ave., Chicago, on October 19, at 6:30 p.m.

The dinner speaker will be R. Ed-

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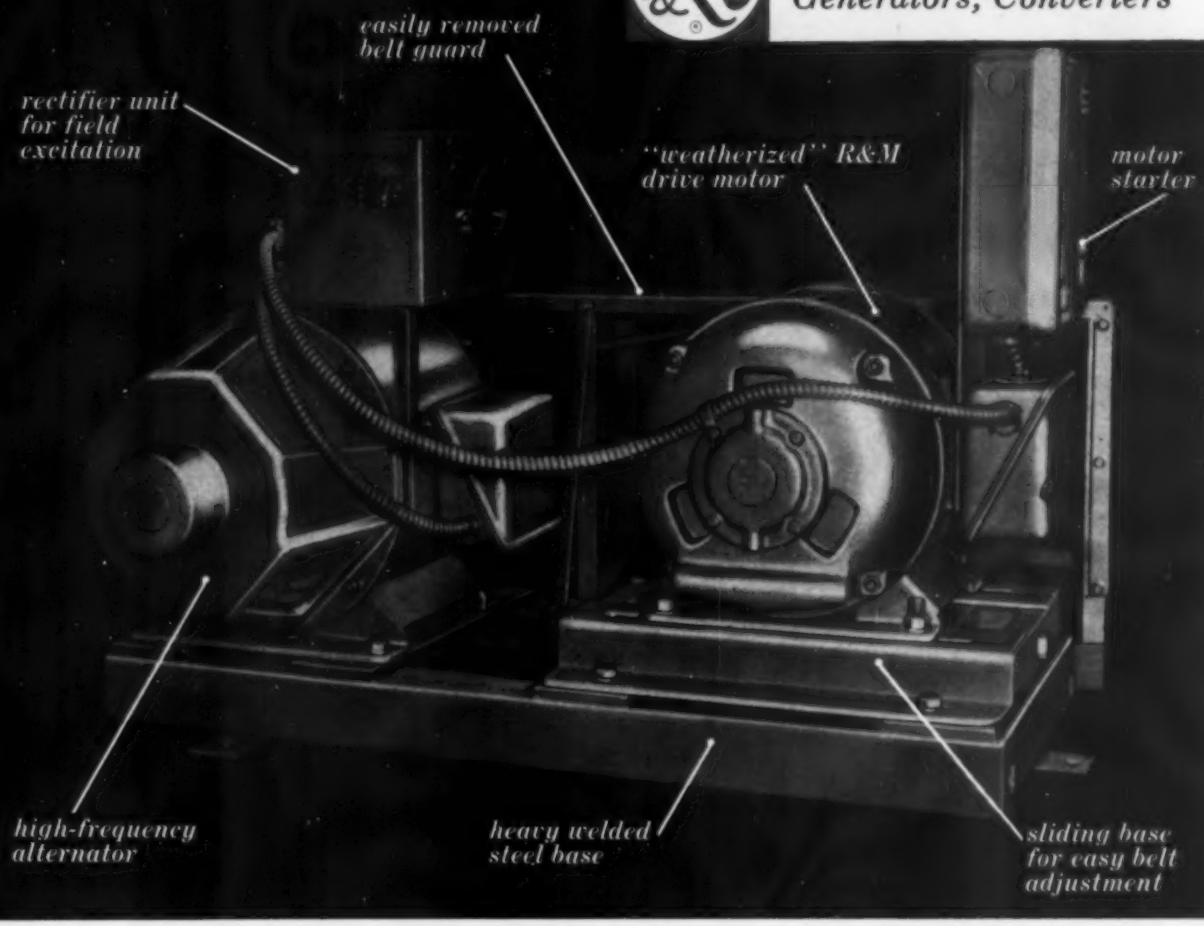
high frequency

Generators, Converters



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'ROUND ABOUT

win Moore, President and Director of Bell & Gossett company, Morton Grove, Illinois. The subject of his talk will be "The Next Decade in Plant Engineering," in which he will point out the present and future responsibilities of the plant engineer.

Plant engineers who would like to attend this dinner meeting, should arrange to get their tickets ($5.50) from Kenneth Dopp, c/o Bell & Gossett Co., 8200 N. Austin Ave., Morton Grove, Illinois.

Plywood Pallet Specs

INFORMATION ON types of plywood, grades, designs, styles and construction techniques is included in the specifications booklet now available. Additional facts as to materials and species of lumber, permissible lumber characteristics, methods of fastenings and their applications, fabrication particulars, permissible nailing defects and dimensional tolerances are covered.

Data in the booklet will provide the user with a comparative method of measuring quality in plywood pallets and pallet containers in order to meet the demands of any situation, including automation systems and mechanical material handling devices.

Entitled "Specifications for Douglas Fir and Western Softwood Plywood Pallets," the publication may be obtained from your pallet supplier or you can send your request to National Wooden Pallet Manufacturers Association, 609 Barr Bldg., Washington, D.C.

Engineering Appointment

James C. Bollerhey, C. E., has been appointed superintendent of steel mill erection at the David W. Murray Company, Cleveland, Ohio.

His engineering experience in the steel industry included superintendent of mechanical maintenance in the Yorkville Tin Plate Mill of National Steel Corporation. For 10 years prior to joining Murray, he was a construction superintendent in charge of steel mill erection work for The McDowell Company.

Editor Gets Preview of Avco's New Building

WHILE AT the site of Avco's Research and Advanced Development Laboratories, in Wilmington, Mass., in connection with an article by the plant engineer, Construction Editor Andy Anderson had an opportunity to examine the plans for a major expansion program. Complete responsibility for the million-and-a-half dollar job was given to Plant Engineering.

Design and construction of the new facility was assigned to the Plant Engineering Department primarily as the result of the successful participation of the department in the construction of the original buildings.

W. O. King, Plant Engineer authored "The Plant Engineer Looks At His Plant—Three Years Later" that appeared in our September issue.

Avco Plant Engineer Bill King, right, looks on as Ed Thiboult, left, layout section chief, points out design features of new building to Andy Anderson.

CLIMAX MOLYBDENUM

Molysulfide® News Digest

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EDITORIAL PAGES OF LEADING TRADE MAGAZINES FEATURE MoS_2 INFORMATION

Higher temperatures, lower temperatures, greater pressures, longer lubrication life, all have combined to focus more attention on the uncommon lubricating values of molybdenum disulphide.

That's why editors are devoting more and more space to descriptions of what MoS_2 can and cannot do.

One article tells how MoS_2 prevents harmful friction in brake linings. Another discusses its use as a compressor lube substitute. Still another reports on tests of epoxy-resin compositions containing high concentrations of MoS_2 for industrial use on bearings, seals and friction strips.

Press fittings, wire drawing, cutting tools, ball joints—there are MoS_2 stories about these uses, too.

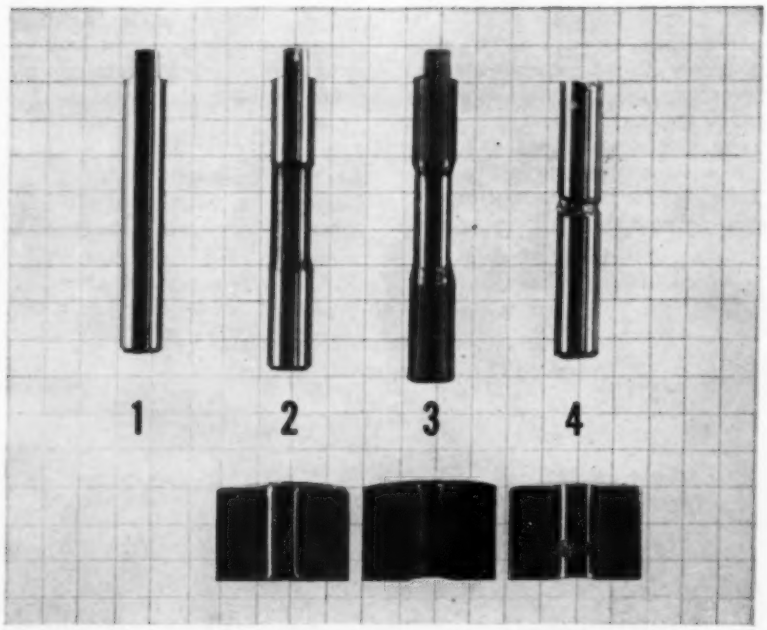
MoS_2 as a solid-film dry lubricant has been the subject of several articles. One details high-temperature properties; another describes a new bearing design that can increase bearing life as much as 450%.

Write us for a complete bibliography of published material on molybdenum disulphide.

P.S. Climax publishes a newsletter that describes even more uses. Let us know if you'd like your name on the mailing list.

When writing, refer to CL-113

Proof of MoS_2's High-Pressure Properties



Photograph above shows mild steel test pins. No. 1: Unused pin, No. 2 (lubricated with mineral oil and Molysulfide) and No. 3 (with Molysulfide bonded coating) were subjected to rotating pressures between bearing halves. Both were elongated and extruded without galling, seizing, or weight loss. No. 4 shows typical failure with conventional lubricant. Note that the key sheared off and pin and block were galled and seized.

When writing, refer to CL-115

Circle 505 on postcard, page 33

ASME SHOW DEVOTES SESSION TO "MOLY" LUBES

New evidence of mounting interest in molybdenum disulphide was shown recently among members of the American Society of Mechanical Engineers. A spokesman for the Climax Chemical Division was invited to speak on "Molybdenum Disulphide as a Lubricant" before the Machine Design Division at the 1961 Design Engineering Conference. A copy of this 24-page paper is available on request.

At the same meeting, engineers from Socony Mobil Oil Company spoke on "Molybdenum Disulphide as an Additive to Improve the Performance of an Automotive Multi-purpose Grease." Write to Climax for a copy of this paper.

When writing, refer to CL-114

HELPFUL WATER CONDITIONING DATA FROM BETZ

POLYELECTROLYTES . . . NEW

New coagulants and coagulant aids have brought about improvements that verge on the spectacular and should be investigated wherever coagulation is practiced.

INDUSTRIES' REQUIREMENTS OF WATER have been estimated to be more than 150 billion gallons per day. Much of this water must be clarified to remove turbidity, color and other impurities before it is suitable for use. The continued growth and expansion of industry has often taxed existing clarification equipment. In addition, contamination of rivers, streams and other surface waters often complicate the coagulation problem.

New materials have been introduced in recent years that bring about remarkable improvement in many difficult coagulation problems. These materials are organic polymers that contain recurring units of small molecular weight, chemically combined to produce high molecular weight polymers. Each of these recurring units carries one or more electrical charges or ionizable groups. Because they are polymers and have the characteristics of electrolytes, they have been designated as polymeric electrolytes or more commonly, polyelectrolytes. Polymers that dissociate to form positively charged polymeric ions are classed as cationic polyelectrolytes. Polymers that produce negatively charged polymeric ions are classed as anionic polyelectrolytes.

Coagulation and Floc Formation

Turbidity and color in natural water supplies are the main impurities normally encountered. Turbidity may be imparted by the presence of suspended matter or it may be due to a colloidal dispersion. Usually it is present in both forms. Color is mainly present in the colloidal state. Coarse suspensions will settle readily but the colloidally dispersed materials will remain suspended almost indefinitely. Table I illustrates the settling time required for particles of various sizes.

The theory underlying coagulation falls into the category of Colloidal or Surface Chemistry—a very complex subject. However, a brief description of the nature of a colloid's electrical charge will serve to explain the mechanism of coagulation and will also illustrate the role played by polyelectrolytes and coagulants in general.

The stability of a turbid water is attributed to the fact that colloidal particles carry the same charge. Identically charged particles repel each other, therefore, continued dispersion rather than precipitation is favored. The precipitation of colloidal particles, however, can be brought about by introducing ions of opposite charge. The relative precipitating power of ions increases markedly with increase in the ion's charge or valence. For example, the aluminum ion (Al^{+++}) is roughly 500 times as effective as the sodium ion (Na^{+}) for precipitating a negatively charged particle. Aluminum and ferric ions with three positive charges are the most commonly used coagulating ions. The polyelectrolytes with their recurring groups dissociate to form many electrically charged polymeric ions and their precipitating power is considerably greater than the precipitating power of the trivalent inorganic ions.

In addition to the mechanism of introducing ions of opposite charge to effect precipitation, the coagulant itself forms an insoluble, gelatinous precipitate or floc—such as aluminum hydroxide or ferric hydroxide—and this floc tends to agglomerate and absorb the turbidity and color particles. The settling rate is dependent upon the floc size, viscosity of the liquid medium (which is a function of temperature) and specific gravity of the floc micelle. Studies have shown that the specific gravity of the floc micelle is very greatly affected by the entrained water between the individual particles in the floc. The organic polyelectrolytes bridge together and greatly compress the individual particles so that less water exists in the micelle itself, thus creating a floc particle of greater density with a more rapid settling rate.

The number of contacts between individual particles per unit of time controls the rate of flocculation. Firmly bound particles better resist the shearing action of the fluid and permit more rapid agitation and faster floc formation. The polyelectrolytes produce tougher, larger and more uniform floc formation which in many cases can permit greater throughput from existing equipment.

Coagulation With Polyelectrolytes

Colloidal clay, the presence of which is one of the major contributing factors to

TABLE I VELOCITIES AT WHICH PARTICLES OF SAND AND SILT WILL SUBSIDE IN STILL WATER 10° C. OR 50° F.

SPECIFIC GRAVITY = 2.65

Diameter of Particle, in mm.	Order of Magnitude	Time Required to Settle 1 Foot
10.0	Gravel	0.3 seconds
1.0	Coarse Sand	3 seconds
0.1	Fine Sand	38 seconds
0.01	Silt	33 minutes
0.001	Bacteria	35 hours
0.0001	Clay Particles	230 days
0.00001	Colloidal Particles	63 years

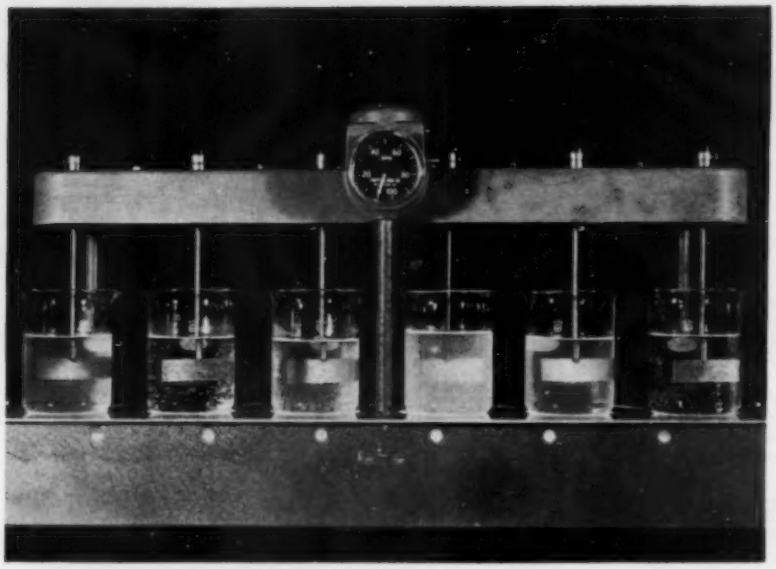


Figure 1—Jar tests in progress.

TOOLS FOR COAGULATION

turbidity of raw water, invariably carries a negative charge. Cationic polyelectrolytes are very effective flocculating agents for clay suspensions. Anionic polyelectrolytes do not flocculate clay suspensions, since both the clay and the anionic polymer have the same negative charge. However, if aluminum or ferric ions are added to initiate the floc formation then the addition of an anionic polymer will materially aid in the rapidity of floc formation as well as increase the settling rate and toughness of the floc. In this case, the anionic polyelectrolyte serves as a coagulant aid, whereas, the cationic polyelectrolytes can function as primary coagulants in the absence of the metal ion coagulants or as coagulant aids when used with the metal ion coagulants.

Jar Testing

When first considering the use of the polyelectrolytes as coagulants or coagulant aids, it is often best to employ a jar testing procedure. Jar testing apparatus is illustrated in Figure 1. The factors that are studied in a jar test are: pH, effect of various primary coagulants and coagulant aids, effect of weighting agents such as clay or calcite, and finally the effect of time and duration of agitation on the various combinations. The tests must be conducted systematically, changing one variable at a time, so that the best combination of primary coagulant, coagulant aid, weighting agent and pH may be determined. The criterion used in selecting the best combination is primarily based on the reduction or lack of turbidity and color in the supernatant water, together with the speed with which the floc forms, the characteristics of the floc and the speed of settling. Depending on the ultimate use of the water, chemical tests for residual aluminum and iron should also be used as a criterion. While the jar tests do not duplicate the conditions of the plant clarifier, they do serve as a good starting point for selecting the best combinations and treatment dosages required.

Case Histories

The use of polyelectrolytes quite often permits substantial increases in capacities of water clarifying units. In many cases this has been accomplished at no increase in cost. In other cases, the cost of the polyelectrolytes has not been justified on a continuous basis, but only during periods when difficulties are encountered with normal coagulation procedures.

In one particular refinery in the midwest, a sludge contact, vertical clarifier was employed to treat river water for various plant requirements. The clarifier had been operating at a flow rate of 1,200 to 1,300 gpm, using lime and ferrous sulfate for coagulation.

Due to very heavy demands on the unit, it was decided to try a water soluble polymer in the coagulation process. An aid of the anionic type exhibited desirable results in extensive jar tests and was, therefore, tried on the commercial unit.

With the use of the polyelectrolyte aid, it was found that the flow rate through the unit could be increased to 2,000 gpm. The quality of the effluent water was superior at the higher rate than the quality obtained without the aid at the original lower rate. One of the side effects of the treatment was that the sludge bed was decreased in volume, due to the higher density of the floc. Blowdown was, therefore, set at a lower rate.

At a northern paper mill, operation of the clarifier at 170 gpm consistently produced an effluent of relatively high turbidity due to carryover of floc. With the use of a polyelectrolyte coagulant aid, an effluent of excellent clarity was produced consistently at a flow of 250 gpm. The turbidity of the effluent was reduced from 16 to less than 5 units with the polyelectrolyte. The sludge density was increased and blowdown was decreased. Over-all treatment costs were reduced from an original 7.7¢ per 1,000 gallons to 4.0¢ per 1,000 gallons, including the cost of the polyelectrolyte aid.

If you have a coagulation problem, BETZ Laboratories will be pleased to offer recommendations. Why not call in a BETZ Field Engineer today? He'll be happy to discuss the problem with you. No obligation, of course.

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Circle 507 on postcard, page 33

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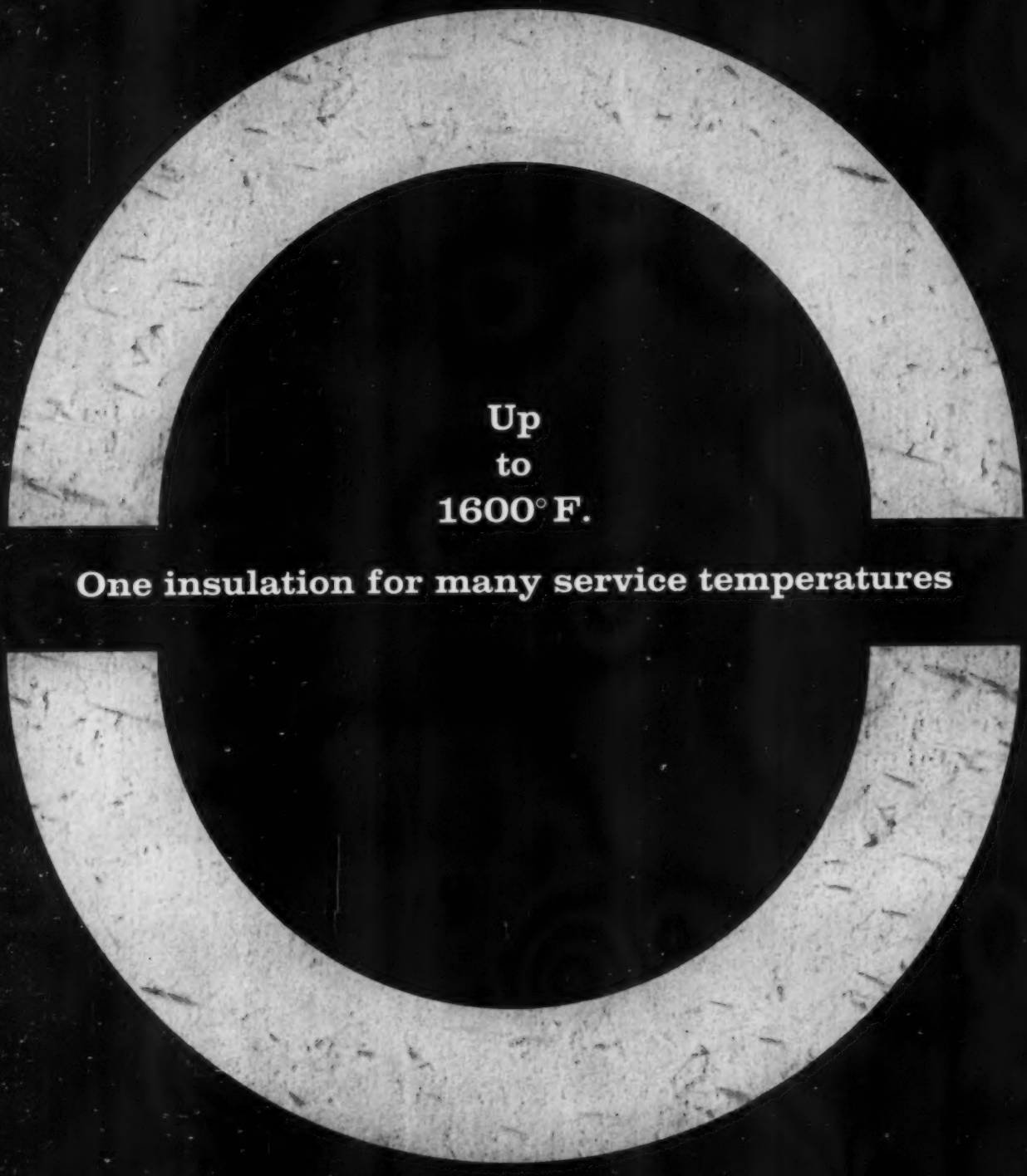
*Trademarks

J-30329



One insulation for many service temperatures

This is Careytemp®

Composition
A new pipe and block insulation material . . . millions of glassed-in air cells of expanded silica bound together, reinforced with inorganic fibres. Gives exceptional strength, yet is lighter than other industrial insulations. Density: 9 lbs. per cu. ft.

High Moisture Resistance
Absorbs practically no moisture. Minimum efficiency loss under wet or humid conditions.

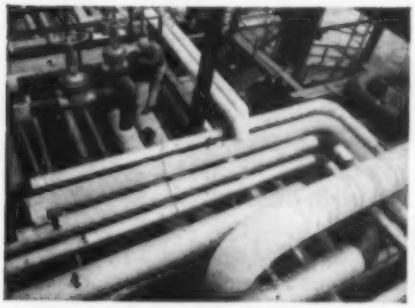
Low Shrinkage
Practically no linear shrinkage, even at high temperatures (0.7% at 1200° F.). Minimum heat loss at joints.

Low Thermal Conductivity
Only .33 B.T.U./sq. ft./hr./°F. at 100° F. — .77 at 1000° F. mean.

High Acid & Corrosion Resistance
Improved performance on acid-processing and stressed stainless steel equipment. Not damaged by most acids. Chemically - inert composition ideal where corrosion is a problem.

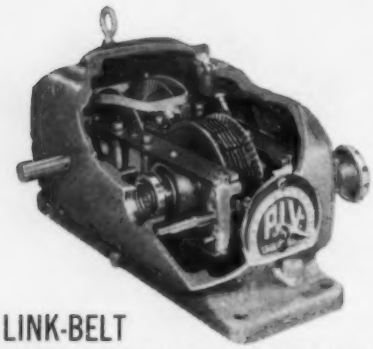
Wide Size Range
Available in larger labor-saving sizes. Blocks in new 24" widths and pipe insulation in half sections through 24" pipe size.

Over four years of field use have proved Careytemp, following thorough laboratory testing at Mellon Institute of Industrial Research. For Careytemp samples and additional specifications, write Dept. PEM1061, Insulation Division, The Philip Carey Mfg. Company, Cincinnati 15, Ohio.



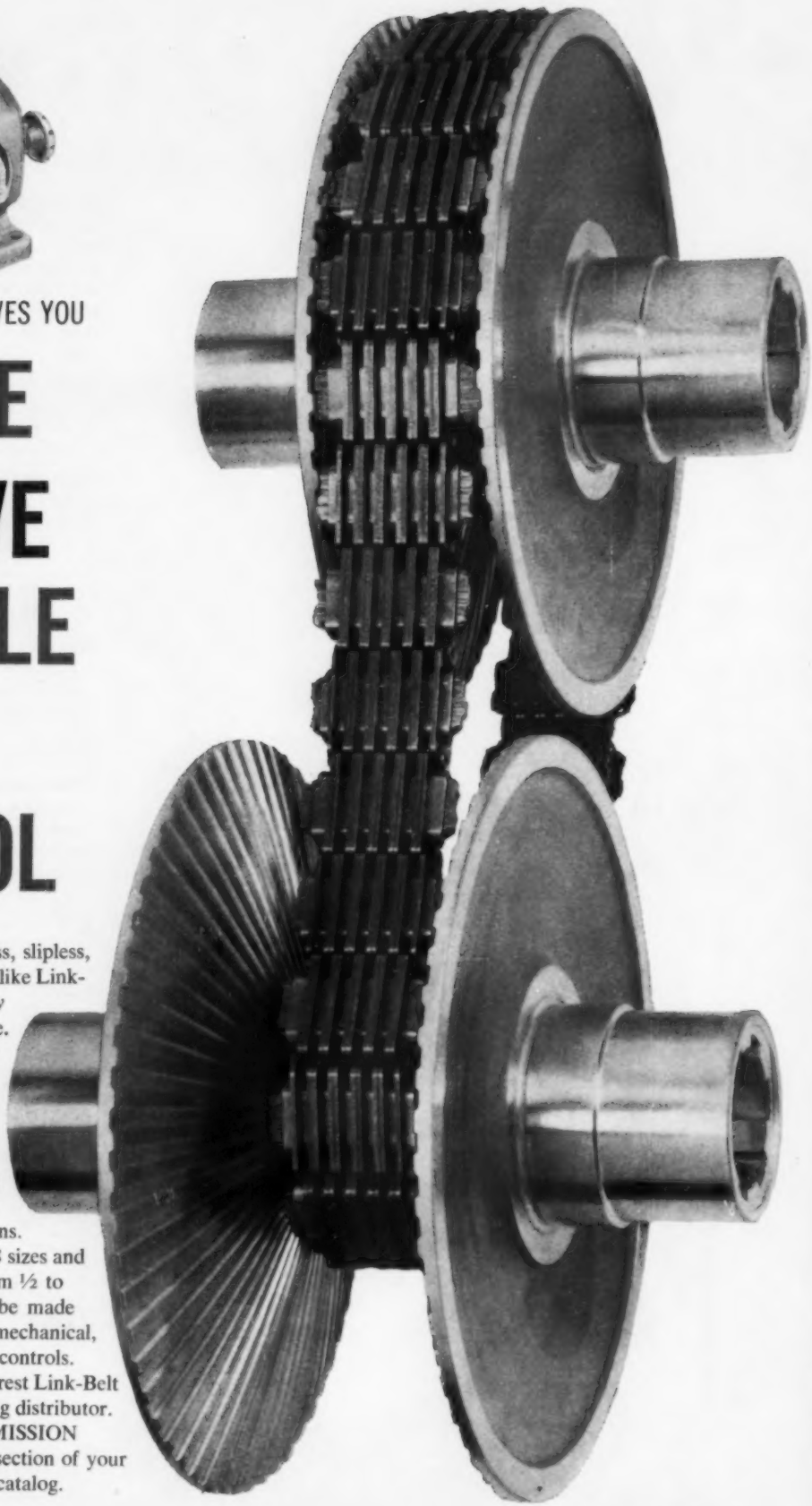
Sohio Chemical Company, Lima, Ohio. Careytemp specified exclusively to cover the wide range of temperatures encountered in this modern chemical processing plant.

Circle 509 on postcard, page 33

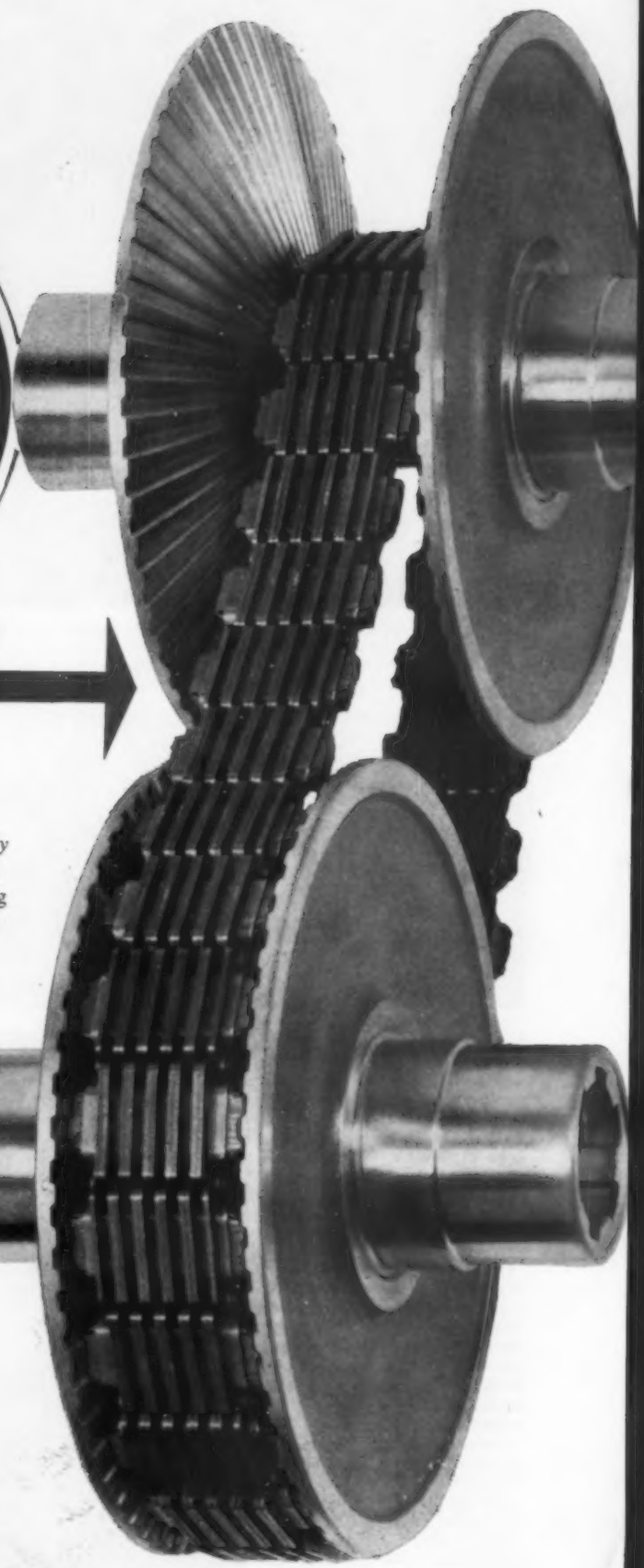


LINK-BELT
CHAIN DRIVEN P.I.V. GIVES YOU

PRECISE POSITIVE VARIABLE SPEED CONTROL



For operations requiring stepless, slipless, speed-changing, there's nothing like Link-Belt's P.I.V. . . . industry's *only chain-driven* variable speed drive. Unusual speed control accuracy results from P.I.V.'s unique design featuring *wheels and chain with teeth.* The two pairs of conical wheels act as gears . . . mesh with self-tooth-forming chain to assure positive contact under all speed and load conditions. Link-Belt's P.I.V. line includes 8 sizes and 16 standard types, capacities from ½ to 25 hp. Speed adjustments can be made manually or automatically with mechanical, hydraulic, pneumatic or electric controls. For full details, contact your nearest Link-Belt office or authorized stock carrying distributor. Look under POWER TRANSMISSION EQUIPMENT in the classified section of your local phone directory. Send for catalog.



P.I.V.®
LINK-BELT

FROM MINIMUM SPEED TO MAXIMUM SPEED
NO SLIPS... NO STOPS... NO STEPS IN BETWEEN

With a Link-Belt P.I.V.—*Positive, Infinitely Variable*—drive, speeds can be varied in an instant, regardless of load and without stopping the driven machine. A turn of the control screw changes the speed. The control screw simultaneously varies the effective diameters of the conically shaped wheels—closing one pair, spreading the other. This automatically, *instantly* adjusts the chain to provide a controlled output speed. Slippage? Not a chance—P.I.V.'s chain-to-wheel grip is positive as a gear.

LINK-BELT

P.I.V. VARIABLE SPEED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock-Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13), South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15,700

Circle 510 on postcard, page 33

Westinghouse helps assure Texas Instruments constant power supply

Handsome exterior is showcased at night by 60 AH 16 floodlights, ideal for decorative lighting applications.

Viewing future expansion areas in TI's 300-acre Dallas site are, left to right: A. P. Hammerstrom, Division Manager, WESCO; L. P. L'Hommedieu, TI's Senior Maintenance Engineer; H. R. Hill, Westinghouse Area Manager; G. K. Jones, Westinghouse Engineer; C. L. Surface, Engineer, Harmon Electrical Construction Co.

More than 50 Westinghouse DT-3 type transformers are located in space frames formed by concrete V-tetrapods separating upper and lower levels. This 80 KVA unit transforms 480 volts to 120/208 volts at the point of utilization. Smaller sizes of DT-3 transformers enable convenient placement even in this cramped location. These vibrationless units are inaudible in engineering spaces below, and their high dependability has resulted in maintenance-free operation for Texas Instruments.

J-94163-1

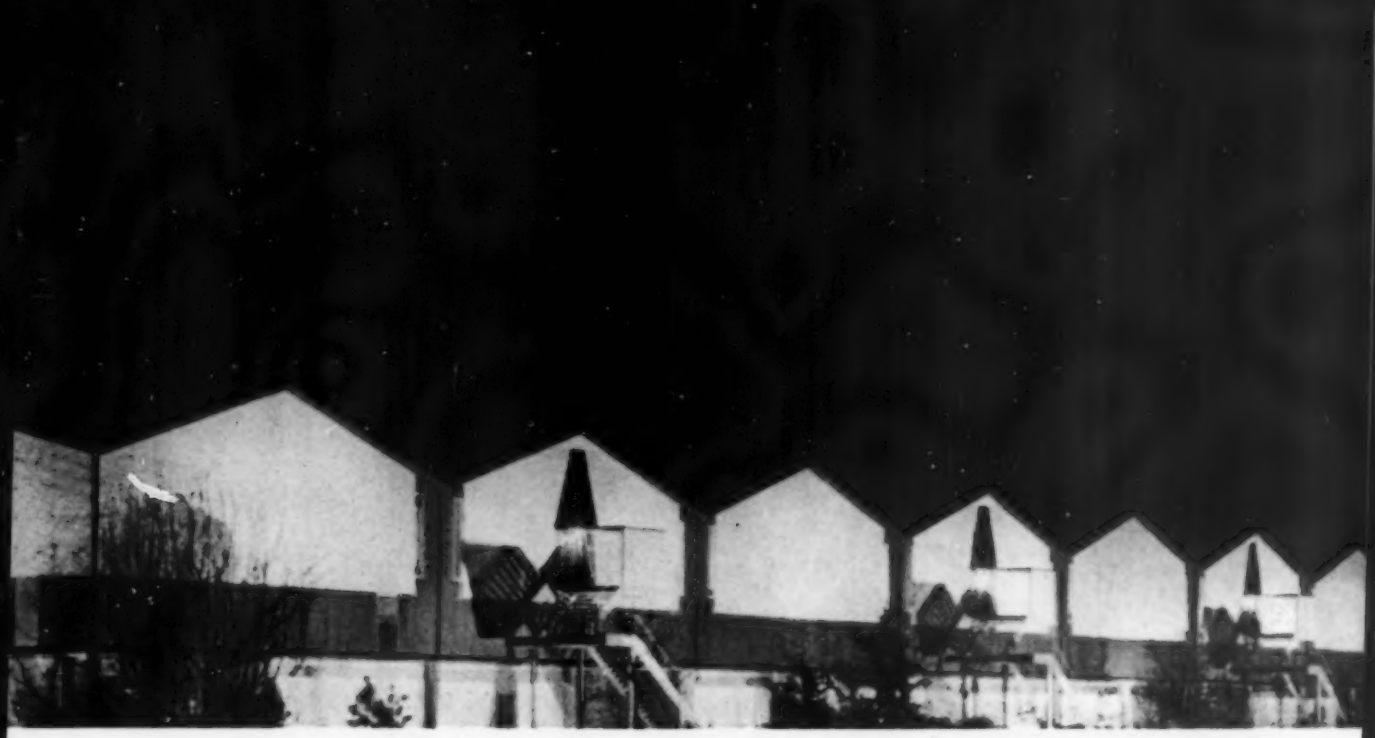
A plant that expresses the attitudes and capacities of its people . . . a power system that must carefully feed electronic miracles . . . these are two important physical parts of the new Texas Instruments, Incorporated, operation at Dallas, Texas.

Behind a striking modern appearance is an intricate complex of engineers and equipment responsible for over 5,000 types of electronic components—from germanium transistors and silicon transistors, diodes, and rectifiers to infrared detecting cells, tantalum capacitors, and precision resistors.

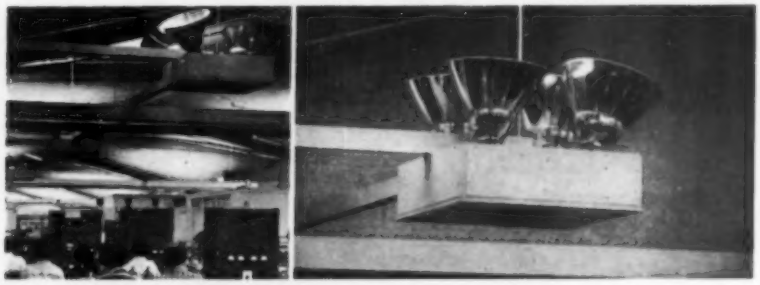
TI's 24-hour manufacturing operation is dependent on a constant, well-controlled power supply. Key elements in this plant's primary selective radial distribution system are four Westinghouse 1000 KVA power centers, each equipped with two primary switches connected to separate feeders. In case of feeder fault—primaries can be switched to restore service. Power centers are quiet enough in operation to permit placement in first floor area adjacent to engineering offices.

Other Westinghouse products selected from the industry's broadest line of electrical-mechanical equipment include dry type transformers, indoor and outdoor floodlighting, motors and control. Application problems were given full attention by Westinghouse sales engineers, working with the contractor and consulting engineer. The completeness of service and product line is available to you for any new construction or planned modernization. You can be sure . . . if it's Westinghouse.

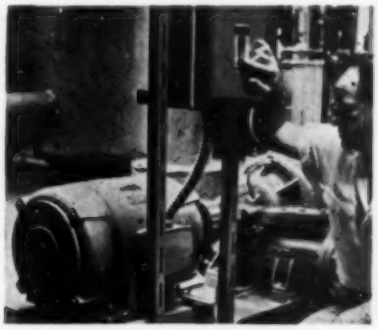
Westinghouse



Owner: Texas Instruments, Incorporated
Architects & Engineers: O'Neil Ford & Richard S. Colley, Corpus Christi and Dallas, Texas
Electrical Contractor: Harmon Electrical Construction Co., Dallas, Texas
Electrical Distributor: Westinghouse Electric Supply Co., Dallas, Texas



More than 1000 Westinghouse ARC 20 floodlights mounted in clusters throughout the plant combine to produce a soft, glarefree, diffused light with a uniform intensity of 64 ft.c. Reason for unique lighting arrangement is a hyperbolic paraboloid roof—designed to carry little weight and with an infinite surface variation making conventional rows of fixtures impractical. Lightweight ARC 20 units are made from spun aluminum offering a high degree of reflection. Lamps are Westinghouse AH-15 mercury vapor, many of which, in original installation, are still operating after more than 23,700 hours continuous duty.



Maintenance-free operation is important on this remotely controlled hot water pump drive. Sealed, prelubricated bearings plus superior insulation give this 30 hp Life Line A drip proof motor reliability without constant attention. Control is a size 3 Class 11-200 Magnetic Lifeline starter which provides motor running protection through bi-metallic type Thermal overload relays. Long contact life is assured through use of de-ion® arc extinction—which splits, stretches and extinguishes an arc faster, with less contact temperature rise than any known system.

L. P. L'Hommedieu, A. P. Hammerstrom and C. L. Surface inspect one of four Westinghouse 1000 KVA ventilated dry type power centers. Each power center consists of two primary fused type LCB switches, 1000 KVA dry type transformers and low voltage switchgear, containing four DB 25 air circuit breakers. Heavy duty Westinghouse DB breakers offer drawout feature for easy inspection and maintenance—provide positive protection necessary in industrial power circuits.

J-94165-2

Circle 511 on postcard, page 33

Kimtowels®
DISPOSABLE SHOP TOWELS

...new from Kimberly-Clark and guaranteed to cut your costs or your money back!

Your towel costs must come down or your money back!

Kimberly-Clark's 1-month guaranteed cost-cutting plan will prove to you that KIMTOWELS can reduce wiping costs. Here's how the plan works: you order a month's supply of Kimtowels. Use them in your entire plant (or in a single department) just as you would cloth wipers. At the end of one month, if your wiping costs haven't gone down, we will gladly refund the cost of the Kimtowels. Fair enough? Send coupon today.

- Look, feel, perform like cloth!
- Usable—over and over!
- Far more economical than cloth!
- Strong, rugged—wet or dry!

plus—no rental; no collecting; no sorting; no storage; no records; no pilferage!

Kimberly-Clark Department No. PE-101, Neenah, Wisconsin

At no obligation to me, please rush information on Kimtowels "GUARANTEED COST-CUTTING PLAN."

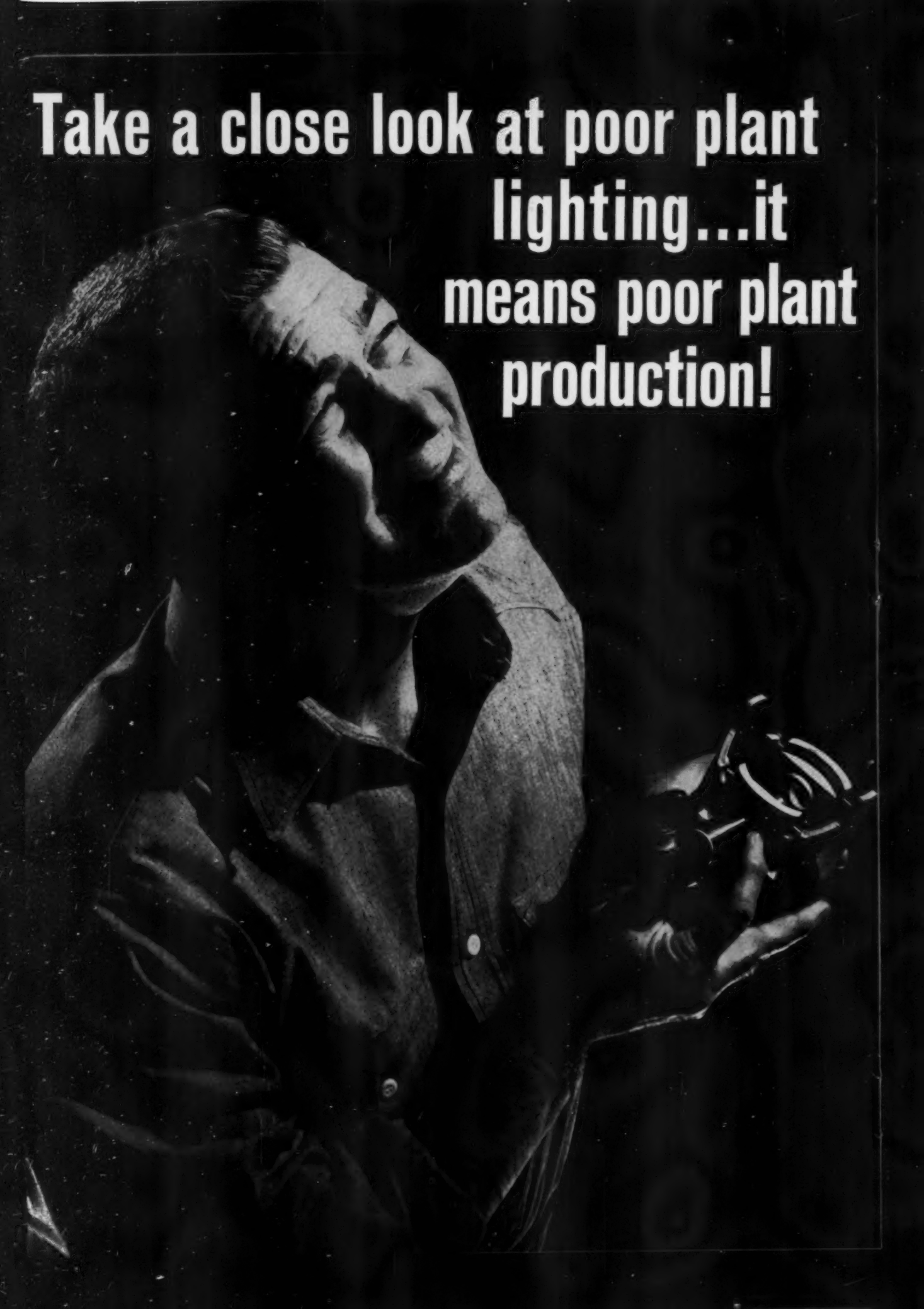
Name.....

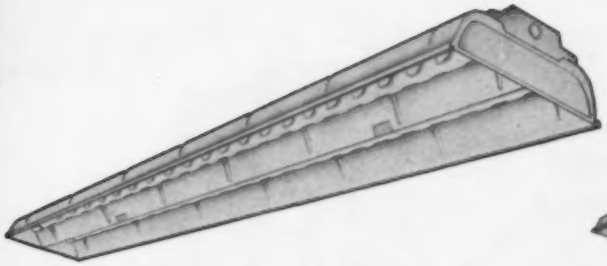
Firm.....

Street.....

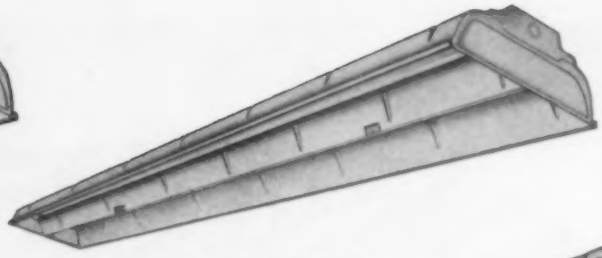
City.....Zone.....State.....

Circle 512 on postcard, page 33


Take a close look at poor plant lighting...it means poor plant production!



CFI-30—Center "Vee" louver gives crosswise shielding of Power Groove lamps. 30% upward lighting.



CFI-25—Excellent visual comfort and economy. For Slimline and Rapid-Start lamps. 25% upward lighting.

Boost output with Day-Brite "Comfort For Industry" Lighting

- Increases visual acuity
- Minimizes glare
- Quickens reflexes
- Prevents accidents
- Increases profits

You can offset rising labor costs and ease today's profit squeeze by meeting currently recommended illumination levels with Day-Brite Comfort For Industry Lighting.

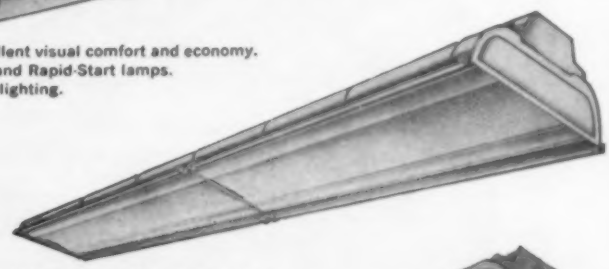
The well-shielded construction of Day-Brite CFI® fixtures reduces glare to a minimum, while upward lighting components cheerfully brighten ceilings and wipe out harsh contrasts. Easier seeing, higher employee morale increase individual output and over-all plant efficiency.

Day-Brite CFI fixtures also cost you less to install, less to maintain . . . due to factory pre-assembly, self-cleaning design, rigid construction and one-man servicing. Phone your Day-Brite representative for details. *Day-Brite Lighting, Inc., St. Louis, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

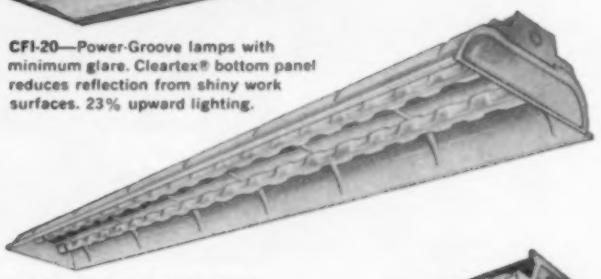
Write for FREE 16-page Guide to Modernization and Relighting: Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo.

DAY-BRITE

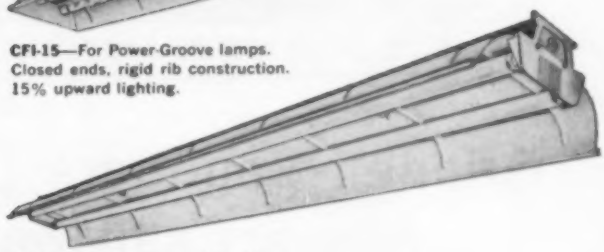
NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT



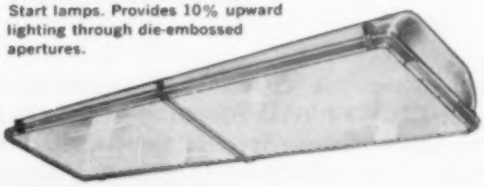
CFI-20—Power-Groove lamps with minimum glare. Cleartex® bottom panel reduces reflection from shiny work surfaces. 23% upward lighting.



CFI-15—For Power-Groove lamps. Closed ends, rigid rib construction. 15% upward lighting.

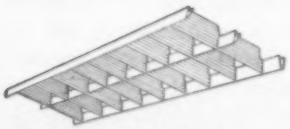


CFI-10—For Slimline and Rapid-Start lamps. Provides 10% upward lighting through die-embossed apertures.



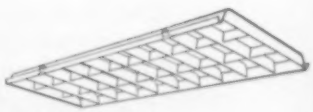
VAPOR-TIGHT—Use where fixtures are exposed to moisture or where non-combustible dust is present. Vinyl gaskated frame. Uses Rapid-Start lamps.

RS-240-TT—For Rapid-Start lamps. Economy . . . with quality features.



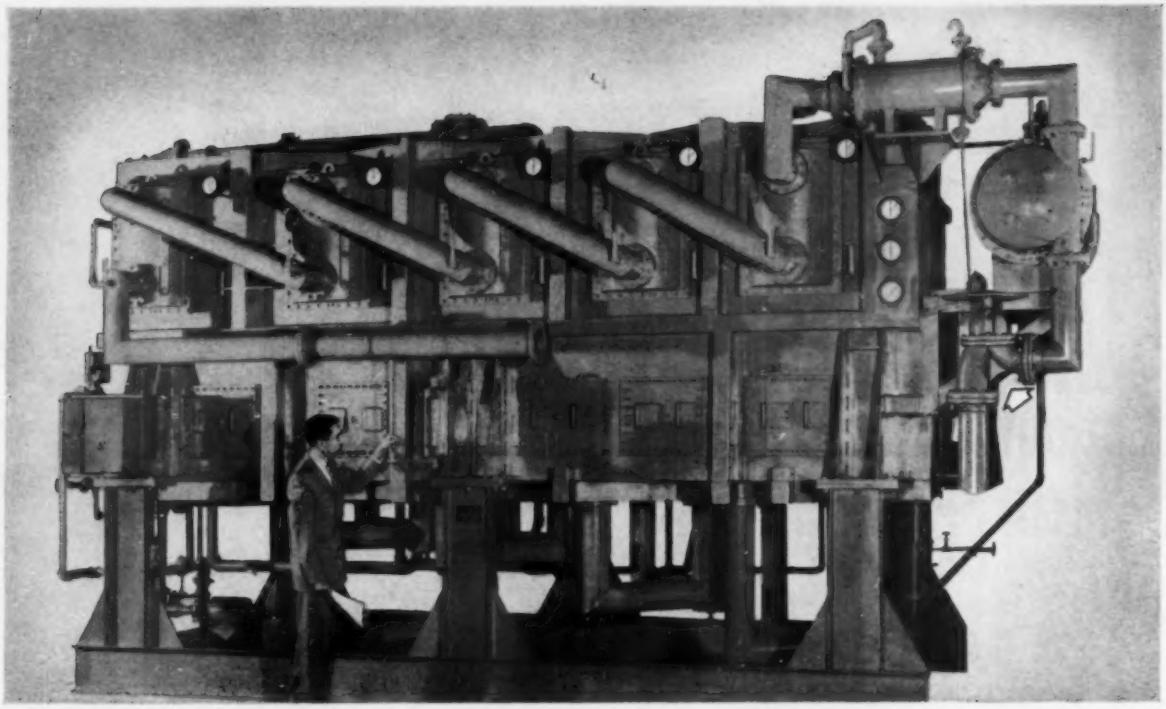
HINGED ALZAK ALUMINUM PARALOUVERS®
Provide the ultimate in visual comfort. Use with CFI-25 and CFI-30 fixtures.

PARALOUVER PATENT NOS. 26833799 AND 507541



HINGED LOUVERS
(Baked white finish)
Use for critical seeing tasks requiring additional shielding, with CFI-10, CFI-15, CFI-25 or CFI-30 fixtures.

Circle 513 on postcard, page 33



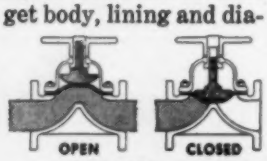
ON LAND At Salinas, a tourist center in Ecuador, this Cleaver-Brooks Flash Evaporator delivers 50,000 gallons of pure, distilled water every 24 hours. It is equipped with two 6", rubber lined, weir-type Grinnell-Saunders Diaphragm Valves — only one of which can be seen from this view.

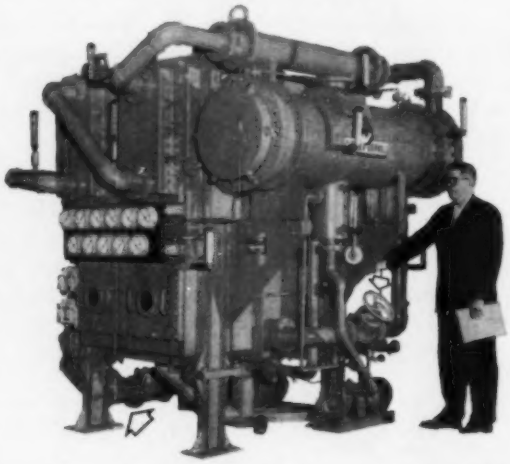
Grinnell-Saunders Diaphragm Valves help convert salt water to fresh water

You can convert sea water to fresh water, in abundant supply, on land . . . or on shipboard, with flash evaporators made by Cleaver-Brooks Special Products, Inc., Waukesha, Wisconsin. Grinnell-Saunders Diaphragm Valves are used as original equipment on these distillation units because they offer positive, leak-tight closure; flow control in throttling position; corrosion-resistance.

You'll find Grinnell-Saunders valves widely used in other fields, too . . . petroleum, papermaking, chemical, food, compressed air . . . to mention a few.

The operating principle of the Grinnell valve is the feature which makes it so adaptable. The diaphragm lifts high for streamline flow in either direction; seals tight for positive closure against grit, scale, solid matter, pressure or vacuum. Bonnet mechanism is completely isolated at all times from the fluid in the line by the diaphragm, preventing corrosion and contamination. Smooth passage, without pockets, eliminates trapping of solids and reduces frictional resistance. And you can get body, lining and diaphragm materials to meet your particular service conditions. Get *all* the facts. Write Grinnell Company, Providence 1, R. I.



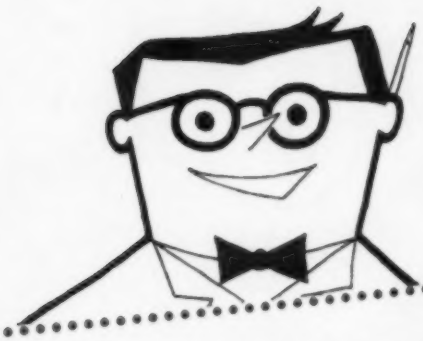


AT SEA The nuclear powered NS Savannah has two 16,000 gallons-per-day Cleaver-Brooks distillation units to supply the entire water requirements of crew and machinery. Each unit has two 4" Grinnell-Saunders Straightway Valves of ductile iron.

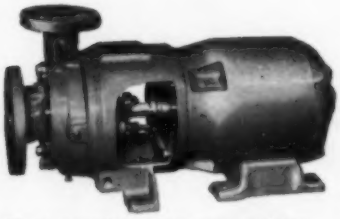
GRINNELL

Pipe, Fittings, Valves, Hangers, Heating and Piping Supplies
Branch Warehouses and Distributors From Coast To Coast

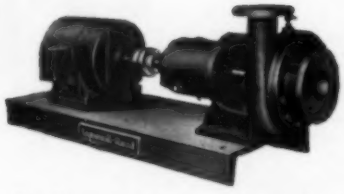
Circle 514 on postcard, page 33



when you discuss pumps what does GPM mean to you?



Close-coupled Motorpumps from ¼ through 75 horsepower. 1, 2 and 4-stage models available as well as self-priming types.



Cradle-mounted pumps from ½ through 100 horsepower. Single and two-stage models available as well as self-priming types.

Horizontally-split pumps from 1½ through 400 horsepower. Single and two-stage models available.

THE TECHNICAL DEFINITION

GPM stands for GALLONS PER MINUTE and is the term used in all calculations having to do with the measurement of the flow of liquids.

BUT THERE'S ANOTHER MEANING TOO

Our other meaning of GPM is GOOD PRODUCTION METHODS. This is the reason why our pumps are able to give you the performance that our designers forecast...greater capacity delivered per kilowatt of power input as well as dependable and longer trouble-free pump life.

When you're in the market for a centrifugal pump we are sure you want the best available...The best design, the best efficiency and the best built...one from Ingersoll-Rand. Our commercial pump line is complete with units ranging to 4000 gallons per minute capacity and heads to 1100 feet. Our trained pump specialists are always ready to help you. Call the nearest Ingersoll-Rand branch office or see our authorized pump distributor. There's no pumping problem too tough to handle.

Ingersoll-Rand

250A9 11 Broadway, New York 4, N.Y.

OTHER PUMPS TO 200,000 GPM—PRESSURES TO 6500 PSIG.

Circle 515 on postcard, page 33

INCREASE YOUR CURRENT

American Steel and Wire
Division of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

CARRYING CAPACITY 45%

...with USS Amerzone-B insulation*

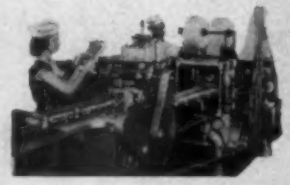
Amerzone-B butyl rubber insulation can be safely operated continuously at 90°C copper temperature. This means you get a 45% increase in current-carrying capacity with Amerzone-B as compared to the capacity of standard 60°C rated compounds. For network service, Amerzone-B will withstand emergency overload copper temperatures *up to 260°* for short periods without damage. No other rubber insulation has such exceptional resistance to heat, moisture, ozone and cold. You can bend it at —40°F. without cracking. Ozone tests to industry standards show no damage to this dense, nonporous insulation. Amerzone-B insulated cables installed over 12 years ago are just as good today as they were when installed. It's the ideal insulation for 5,000 to 15,000-volt cable. You can use USS Tiger Brand type RR Cable with Amerzone-B insulation anywhere . . . bury it, put it in conduits or ducts, string it overhead.

USS Tiger Brand type RR Cables are also made with other types of rubber insulation, each one compounded to do a special job. For complete information on Amerzone-B insulated cables or any other Tiger Brand Cable, call our nearest Sales Office or write American Steel and Wire, Dept. 1242, Rockefeller Building, Cleveland 13, Ohio.

USS, Tiger Brand and Amerzone-B are registered trademarks

*Conditions: 3 single conductors # 4/0 in 2½" conduit (exposed & enclosed), 40°C ambient air temperature

Circle 516 on postcard, page 33



"THIS LUBRICANT REDUCES SERVICE CALLS"

—says LYNCH CORPORATION
Toledo, Ohio

"LUBRIPLATE greatly reduces unnecessary wear and prolongs the life of machines. It has reduced customer calls for service to a minimum. Our Service Engineers can readily spot machines that have had other than LUBRIPLATE Lubrication, as these machines do not give the service they should."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

Circle 517 on postcard, page 33

BACKTALK AND FORETHOUGHTS

Edited by Bea Berghorn

Glad To Hear from New Subscriber

PLANT ENGINEERING:

"I would appreciate receiving one tear sheet of the article 'The Care and Maintenance of Scientists' that appeared in the June issue of PLANT ENGINEERING. Being a new subscriber to your magazine I missed this issue." *William Stoebel, Plant Engineer, Physics Research Div., Geophysics Corp. of America, Bedford, Mass.*

PLANT ENGINEERING:

"Would you please forward a couple of reprints of the article entitled 'The Care and Maintenance of Scientists' to the following address:" *T. Gordon Meikle, Manager, Plant Engineering Services Division, Jet Propulsion Laboratory, Pasadena, Calif.*

PLANT ENGINEERING:

"I have recently read in the August issue of PLANT ENGINEERING about available tear sheets of the article 'The Care and Maintenance of Scientists' published in the June issue.

"Please send two tear sheets of the article." *R. W. Wolfe, Manager, Technical Assistance, Visking Co., Terre Haute, Ind.*

■ We still have a few tear sheets of this popular article. They will be sent on a 'first come, first served' request basis.—*Editors.*

Tear Sheets Still Available

PLANT ENGINEERING:

"Would you please send us tear sheets of the article on disposing of cyanide wastes.

"This article appeared in your June, 1961 issue." *J. H. Sigmund, Safety Department, The Harshaw Chemical Co., Cleveland, Ohio.*

■ Tear sheets of this article 'Plant Burns Its Cyanide Wastes' are yours for the asking.—*Editors.*

Weldors Again

PLANT ENGINEERING:

"We are desirous of obtaining reprints of your article, 'Training Maintenance Weldors, Part I', which appeared in PLANT ENGINEERING's April issue.

"We would like to have reprints of the article printed in the April issue as well as the May and June articles if they would be available.

"If reprints are not available will you kindly send us an additional copy of PLANT ENGINEERING, May and June issue.

"If there is a charge for any of the above, you may bill us for same or advise us the cost and we will forward our check." *V. Beno, Columbia Boiler Company of Pottstown, Pottstown, Pa.*

PLANT ENGINEERING:

"I noticed your excellent article in the May issue of PLANT ENGINEERING on 'Training Maintenance Weldors—Part II'.

"Unfortunately, we missed Part I.

"In order to give this series adequate distribution throughout our organization, I would appreciate two sets of tear sheets for both Part I and II if they are available." *George A. Schaffert, Chief Engineer, Stonecutter Mills Corp., Spindale, N.C.*

■ The 22-page reprint of this five-part series is now available for $1.00 per copy. The five parts consist of: 1. Basic Welding Information; 2. Weld Faults, Causes and Corrections; 3. Selecting Electrodes; 4. Destructive Testing of Welds; 5. Qualification Testing. If you would like a copy, simply send your request to the Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Ill.—*Editors.*

Boiler Water Treatment

PLANT ENGINEERING:

"Please send me four reprint copies or tear sheets of the article 'A B C's of Boiler Water Treatment Spelled Out in Q's and A's,' which appeared in the August 1961 issue of PLANT ENGINEERING." *S. A. Ribbik, W. & W. Pickle Co., Montgomery, Alabama.*

Point in Question

PLANT ENGINEERING:

"I have just read the article 'An Evaluation of Grounded Neutral Power Systems' in your June 1961 issue and am amazed that the author favors resistance grounding of the 277-480 volt system, in lieu of solid grounding.

"It would appear to me that a grounded system would lend itself far easier to ground fault detection because these faults are localized and trip immediately, providing that properly rated short circuit protective devices are used. No costly ground detecting gadgets are necessary. In addition, a solidly grounded system would overcome

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Circle 518 on postcard, page 33

Hints on fluorescent starter selection

G-E STARTERS GIVE YOU SPECIAL PROTECTION AGAINST SHOCKS

General Electric puts insulating liners in its fluorescent starters, to protect maintenance people against the slightest chance of a shock. The liners prevent inside elements from touching and charging the outside metal can — a possibility in unlined starters if they are mistreated or dropped.

For extra safety — use G-E starters. And to get helpful starter ideas, ask your G-E distributor for the "G-E Starter Selection Chart and Maintenance Guide for Fluorescent Lighting." General Electric Company, Wiring Device Department, Providence 7, R. I.

GENERAL ELECTRIC

Circle 519 on postcard, page 33

BACKTALK— FORETHOUGHTS

the safety hazard of a "hot" conductor being grounded through a machinery housing or building steel and left that way simply because a production operation cannot be interrupted." *W. D. Shatraw, Electrical Engineer, General Electric Co., Waterford, N. Y.*

Comments from the Author

PLANT ENGINEERING:

"Regarding Mr. W. D. Shatraw's comments, it is admitted that resistance grounding on a 277/480 volt system with its related detection devices (an ammeter and a relay feeding an annunciator) adds to the cost of the system as compared to solid grounding, but the cost is quite nominal. We have just completed two such systems, one a 500 KVA substation and the other on a 750 KVA substation. The added cost was about $200 in material plus $50 for labor.

"However, with resistance grounding there is no need for a neutral conductor and in these two cases the savings in copper and labor costs by omitting the "neutral" conduit more than offset the cost of the resistance ammeter and relay so that the over-all cost of the installations was less. Also in both of these cases lighting was being served from a separate source so that there was no other compelling use for a solidly grounded 277 volt system. While solidly grounding the neutral conductor to each electrical equipment enclosure is an added safeguard, it does not take the place of external grounds of such equipment to the building structure and water piping and electrode grounding system. These grounds, it is believed, provide all of the grounding necessary at this voltage level. Hence, the solidly grounded neutral provides little real improvement in electrical safety from the standpoint of grounding." *J. G. Howell, Pacific Coast Div., Owens-Illinois, Oakland, Calif.*

Thanks for the Kind Words

PLANT ENGINEERING:

"We would appreciate receiving 12 reprints of the article entitled 'Cloth Dust Filters—Their Selection, Application and Maintenance' by R. L. Clement, in the August 1961 issue.

"We wish to compliment you on publishing this article which is by far the best we have ever seen on dust collectors. It is so informative and practical, we are certain that it pointed out the solution to many of our dust collector and filter problems. For that reason, we wish to provide a copy for each of our engineers and maintenance supervisors." *R. F. Barker, Plant Mfg. Engineer, Bond Crown and Cork Div. of Continental Can Co., Inc., Wilmington, Del.*

PLANT ENGINEERING:

"I would like to request a copy of an article entitled 'Selection, Application and Maintenance of Cloth Dust Filters' by R. L. Clement. This article appeared in your August, 1961 issue of PLANT ENGINEERING.

"Thank you for your kind attention to this request." *C. R. Minemyer, P. E., Engineering Dept., Young Machinery Co., Inc., Muncy, Pa.*

■ Tear sheets have been sent with our compliments. We are very pleased that this article has proven so helpful to our readers.—*Editors.*

Selecting Best Voltage System

PLANT ENGINEERING:

"Please send me a copy of the following article which appeared in your publication in March, 1960, page 125. It is entitled 'Selecting Best System Voltage' by Mr. R. L. Nailen.

"Please bill me if there is any charge in connection with providing this." *R. A. Cronenwett, Westinghouse Electric Corp., New York 5, N. Y.*

Tear Sheets Available

PLANT ENGINEERING:

"Are reprints available of the article 'Managing a PM Program' which appeared in the July issue of PLANT ENGINEERING? If so, please mail us fifteen copies and bill us accordingly." *W. E. Mowen, Works Engineer, E. I. du Pont de Nemours and Co., Louisville, Ky.*

■ Tear sheets of this helpful article are still available and have been sent with our compliments.—*Editors.*

Perforated Acoustical Tile

PLANT ENGINEERING:

"We would like to obtain additional information on the Armstrong Cork Co., perforated acoustical tile used for air diffusion.

"Reference to this tile was made in the article entitled 'Control Center Monitors Air Conditioning,' which appeared in the June PLANT ENGINEERING." *E. Calligeros, Plant Engineer, American Machine and Foundry Co., Springdale, Conn.*

■ Mr. Calligeros' request has been forwarded to Armstrong Cork Co., Lancaster, Pa.—*Editors.*

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Performance proves it, year after year—you can count on Powell Valves to help you solve the toughest flow control problems of handling water, oil, gas, steam, air or corrosive fluids.

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200-pound Bronze Globe Valve —Fig. 102. Union bonnet. Renewable nickel-bronze seat and disc. Sizes, ⅛" through 3". Angle and flanged end valves available.

150-pound Bronze Gate Valve—Fig. 2714. Union bonnet. Inside screw rising stem. Sizes, ¼" through 3" with solid wedge; ½" through 3" with split wedge.

150-pound Bronze Globe Valves —Fig. 150. Union bonnet. Renewable composition disc. Sizes, ⅛" through 3". Angle and flanged end valves can be supplied.

150-pound Bronze Gate Valve—Fig. 1414G. Bolted, flanged yoke-bonnet. Outside screw rising stem. Solid wedge. Sizes, 2" through 12". Screwed end valves can be furnished.

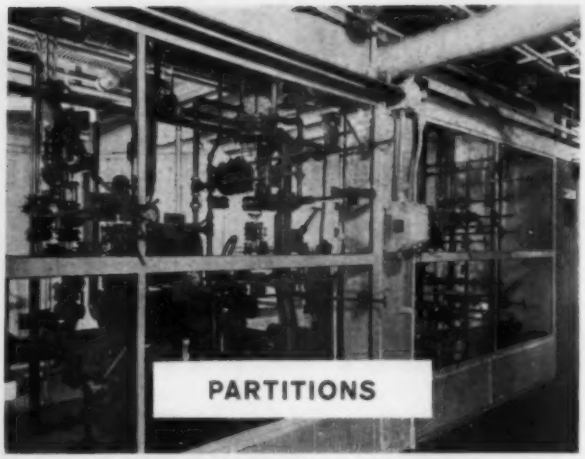
See Our Catalog in Sweet's

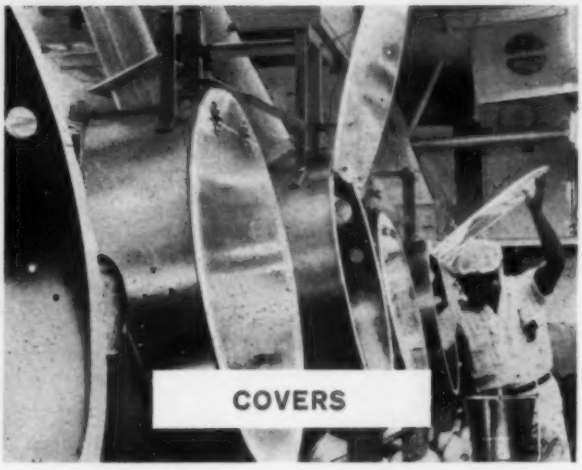
115th year of manufacturing industrial valves for the free world

POWELL DEPENDABLE VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

Circle 520 on postcard, page 33





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Circle 521 on postcard, page 33

BULLETINS

JUST RELEASED and OF IMMEDIATE PLANT INTEREST

PUMPS, COMPRESSORS

Pump Fundamentals

Non-technical, elementary outline of characteristics, operation and selection of reciprocating, rotary and centrifugal pumps is contained in 16-pp Form 5773J. Includes definitions, basic formulae, and application data. Goulds Pumps, Inc.

For a copy, circle 101 on Post Card

Pump Selection Guide

"When You Buy A Pump," pocket-sized, 12-pp booklet, aids in selecting pumps for water supply or booster service. Starting with factors to consider in choosing a pump, various types are discussed and a comparison checklist of desirable features provided. Sumo Pumps, Inc.

For a copy, circle 102 on Post Card

Close-Coupled End-Suction Pumps

Included in 8-pp Bulletin 108, on close-coupled end-suction centrifugal pumps, are cross-sectional views, selection chart, dimensions, optional assembly positions, parts identification, limitations chart. Aurora Pump Div., The New York Air Brake Co.

For a copy, circle 103 on Post Card

Chemical Process Centrifugal Pump

Information on bearing life expectancy and shaft deflection, interchangeability charts and diagrams, and performance, application and dimension data on chemical process pumps are presented in 16-pp Bulletin 725.1. Section drawings, construction details, composite curves included. Goulds Pumps, Inc.

For a copy, circle 104 on Post Card

For Pumping Problem Liquids

Design and construction features of the Electri-Cand, a sealless, leakless pump for efficient and safe handling of problem liquids, are presented in Bulletin 52B8471B. It includes a list of typical solutions handled in various fields. Allis-Chalmers Mfg. Co.

For a copy, circle 105 on Post Card

Low Speed, Heavy Duty Pump

Construction features of solids pump are illustrated and described in a cutaway view in Bulletin 190, with design drawings and specification chart. Morris Machine Works.

For a copy, circle 106 on Post Card

Air Pumps for Vacuum, Pressure

Catalog 561, 32 pp, gives complete data on pumps, motors, boosters and accessories, with details of construction, dimensions, capacities, performance curves and engineering and installation data. Cover index is keyed for handy use. Leiman Bros. Inc.

For a copy, circle 107 on Post Card

Centrifugal Pumps

Pumps for corrosive service, their performance curves and other technical data, are covered in Bulletin 301, 8 pp. Industrial Filter & Pump Mfg. Co.

For a copy, circle 108 on Post Card

Pump and Compressor Selector

Set this slide rule at required air flow in cfm and a choice of rotary air pump models is indicated. Setting pointer on opposite side of selector gives motor horsepower requirements and air flow characteristics over range of 0 to 28 in. Hg vacuum or 0 to 30 psig pressure. Gast Mfg. Corp.

For a copy, circle 109 on Post Card

LUBRICATION

Lubrication Systems and Equipment

Described in this 36-pp catalog are direct, single line, dual line, oil circulating and constant pressure systems. Lubrication equipment covered includes grease pumps, greasing units, lubricators, centralized systems, barrel pumps, hand-operated lubricators, pumps, crane-rail lubricators. Research Appliance Co.

For a copy, circle 110 on Post Card

Oilers, Controls, Lubricators

Illustrated Circular 580 describes a line of bottle oilers for plain bearing lubrication, providing dimensions, oil capacities, installation techniques, application. Lunkenheimer Co.

For a copy, circle 111 on Post Card

Solid Lubricant Coatings

This comprehensive 20-pp booklet on lubricants discusses basic concept of molybdenum disulfide additives employed to enhance temperature capabilities. Contains charts diagraming reduction of frictional resistance between moving parts, and sections on functional operation, physical properties. Hercules Packing Corp.

For a copy, circle 112 on Post Card

VALVES, PIPING, FITTINGS

Water Relief Valves

ASME-rated pressure-only relief valves are described in brochure F-ASME-1961, 8 pp. Installation diagrams, rating tables, sizes and capacities. Watts Regulator Co.

For a copy, circle 113 on Post Card

Clip-Type Gate Valve

Described in Circular 561 are clip-type gate valves designed to withstand corrosive actions too severe for lighter valves. Two types are featured —the iron-body, bronze-mounted for general corrosive service; and the all-iron for solutions which attack bronze. Lunkenheimer Co.

For a copy, circle 114 on Post Card

Control Valve Manual

Comprehensive selection data on pneumatic diaphragm and piston actuators and discussion of valve body components and materials are presented in 64-pp Bulletin E-600. Includes illustrations to facilitate selection of control valve for specific application, pressure-temperature ratings. Fisher Governor Co.

For a copy, circle 115 on Post Card

Ammonia Valves

Some 292 valves and accessories for ammonia refrigeration, L-P gas service, and other applications are described in 12-pp Catalog 203. Cutaway views showing features of construction and specification charts included. Henry Valve Co.

For a copy, circle 116 on Post Card

On Glass Reinforced Plastic Pipe

Three reference bulletins deal with centrifugally cast, thermoset epoxy resin, glass reinforced pipe for handling pressure and corrosion problems. The first, a 12-pp booklet, describes product, its industry applications and physical properties. A folder deals with structural use. A 16-pp technical book provides specification data. Fibercast Co.

For a copy, circle 117 on Post Card

Flexible Connectors

Manual AM-9, 16 pp, analyzes flexible pipe connectors, their application, design and handling. Sections cover: analysis, interpretation of specifications, how to avoid failures, installation. Allied Metal Hose Co.

For a copy, circle 118 on Post Card

V-Band Coupling Economies

Sixteen-page Booklet SDP-2, "Economics of the V-Band Coupling" gives cost comparisons between V-bands and other joining methods. Explains how hidden manufacturing costs can be reduced; savings in weight, installation and assembly time are illustrated. Marman Div., Aeroquip Corp.

For a copy, circle 119 on Post Card

Selecting Quick-Connect Couplings

Catalog 60A, 62 pp, makes it easy to select proper quick connect/disconnect couplings from among hundreds of combinations available. Also features packer usage guide listing some 575 fluids and gases and suggesting types of seals to be used with them at various temperature limits. Construction details, dimensions and weights provided. Snap-Tite, Inc.

For a copy, circle 120 on Post Card

Postage-free Reader Service Cards for your convenience in ordering these bulletins are provided on pages 33-34. You may also use the post cards for ordering any literature mentioned in the ads.

BULLETINS

(Begins on page 31)

INSULATION, REFRACTORIES

Insulating and Finishing Materials

Clute Cotes, a planned series of five industrial insulating and finishing asbestos cements, are described as to features and application in this bulletin. Specifications provided for each product. The Clute Corp.

For a copy, circle 121 on Post Card

Why Insulating Firebrick

Light weight, strength, high insulating properties and other advantages of insulating firebrick are stressed in 36-pp Bulletin R-38. Also provides application and selection data and illustrates use in metals, ceramics, chemical, refinery and other industries. Refractories Div., The Babcock & Wilcox Co.

For a copy, circle 122 on Post Card

Jacketed Insulation System

Described in 8-pp Bulletin IN-217A is an integrated pipe insulation combining metal jacketing, high temperature calcium silicate insulation, and a moisture barrier in one plant-fabricated unit. Installation details and specifications. Johns-Manville.

For a copy, circle 123 on Post Card

MECHANICAL POWER TRANSMISSION

Gear Speed Reducers

Catalog 42C, 24 pp, is a handbook on single reduction, right-angle spiral bevel gear reducers of horizontal and vertical design, providing formulas for, and examples of, selection and a guide for determining load characteristics. D. O. James Gear Mfg. Co.

For a copy, circle 124 on Post Card

Air-Actuated Clutches

Benefits of designing or modernizing heavy-duty grinding mills with air-actuated clutches are detailed in Bulletin ML-199. Outlines such benefits as smooth start-up, prevention of electrical circuit overload, reduced peak power demand. Fawick Corp.

For a copy, circle 125 on Post Card

Air Clutches and Brakes

Design details and advantages of Power Flo industrial air clutches and brakes are outlined in Engineering Bulletin 57A. Drawings, engineering specifications and capacity table. Mid-States Industrial Clutch Co.

For a copy, circle 126 on Post Card

Guide to V-S Belt Replacement

Twenty-pp Bulletin 24103 lists applications of all known manufacturers of equipment using variable-speed belts. Also lists parts numbers with the corresponding Wood's numbers. T. B. Wood's Sons Co.

For a copy, circle 127 on Post Card

Bearing Parts and Nomenclature

Ball and roller bearing parts and terms are defined and illustrated in pocket-size 24-pp Form 343. Also covered are ball installation, dimensions, loads, alignment, types and functions of self-aligning, non self-aligning, and thrust bearings. SKF Industries, Inc.

For a copy, circle 128 on Post Card

Rod Ends, Spherical Bearings

Featured in 12-pp Catalog 102 are Alinabal rod ends and spherical bearings. Gives dimensional data, ratings, materials, application suggestions. New standard items included are large size rod ends with bores up to 2 in., and control assemblies in six sizes. SBB Div., MPB, Inc.

For a copy, circle 129 on Post Card

FANS, VENTILATION

Maximum-Duty Fans

Bulletin A-1401, 48 pp, discusses construction and operation of Sirocco fans, with drive arrangements, control methods and types of drives illustrated. Includes capacity tables and outline drawings keyed to tabular dimensional data. Industrial Div., American-Standard.

For a copy, circle 130 on Post Card

Aluminum Directional Diffusers

Five frame styles and fourteen core patterns of all-extruded aluminum Type D diffusers are illustrated in Catalog D7-61, 12 pp. Detailed selection and installation data included. Waterloo Register Co., Inc.

For a copy, circle 131 on Post Card

Facts on Fire Venting

How to reduce total destruction of commercial and industrial property through use of fire vents is explained in 8-pp Bulletin FY-R59. Discusses importance of proper sizing and positioning of fire vents, includes specifications, fire hazard rating charts. Penn Ventilator Co., Inc.

For a copy, circle 132 on Post Card

ELECTRICAL

Low Speed Synchronous Motors

The performance, dependability and lasting economy of Ideal motors are discussed in Bulletin 502, 12 pp. Includes construction, modifications, and application data chart. The Ideal Electric & Mfg. Co.

For a copy, circle 133 on Post Card

Horizontal, Vertical Pump Motors

Open jet-pump and close coupled a-c pump motors in single phase capacitor and three-phase squirrel cage types are featured in 6-pp Bulletin L-4121A. Kingston-Conley, Inc.

For a copy, circle 135 on Post Card

Dry-Type Transformers

Single phase, three phase and phase changer transformers are detailed in two-color Bulletin 102-261, 36 pp. Wiring diagrams, specifications and prices. Atlantic Transformer Co.

For a copy, circle 136 on Post Card

Oil Circuit Breaker

Advantages of 5-cycle Type OZ distribution oil circuit breaker for 14.4 and 23 kv is described in 8-pp Bulletin 71B9705. Construction features are illustrated and dimensions and ratings tabulated. Allis-Chalmers Mfg. Co.

For a copy, circle 137 on Post Card

300-V Industrial Relay

Advantages of company's 300-v relay which reduces panel space requirements and provides own wiring trough are detailed in 12-pp Bulletin GEA-7329. Includes detailed ordering information, and outline dimensions. General Electric Co.

For a copy, circle 138 on Post Card

Snap-Action Switches

Micro-Tips 30, a "how others do it" publication, illustrates use of switches to increase production efficiency, featuring five methods which can save man hours, protect operators and machinery, and eliminate waste. Micro Switch, Div. Minneapolis-Honeywell Regulator Co.

For a copy, circle 139 on Post Card

Power Fuse Selection Guide

Application and selection of high-voltage power fuses are described in 16-pp booklet, Application Data 36-660. Covers information on interrupting ability, continuous current ratings, and melting characteristics. Westinghouse Electric Corp.

For a copy, circle 140 on Post Card

Flexible Wiring Conduit

Bulletin S-544 covers diameters, weights and specification data of four types of Sealtite liquid-tight wiring conduit, including Underwriters' listed. Anaconda Metal Hose Div.

For a copy, circle 141 on Post Card

Adjustable Under-Floor Boxes

Boxes and accessories for shallow and normal fill floors are shown in Bulletin F13-144, along with ordering specifications and prices. The Thomas & Betts Co., Inc.

For a copy, circle 142 on Post Card

PLANT SITES

Industrial Colorado

This colorful folder is divided into eight sections covering such factors as raw materials, transportation, market and labor, industrial sites etc. Each section contains a booklet providing pertinent information, statistics and maps featuring advantages of the state for plant location. State of Colorado.

For a copy, circle 143 on Post Card

What Nebraska Offers

This 12-pp brochure on Nebraska covers factors of importance in industrial location decisions. Gives information on state's labor and tax records, water supply, utilities, transportation, educational and cultural facilities, recreation, etc. Div. of Nebraska Resources.

For a copy, circle 144 on Post Card

(More Bulletins on page 267)

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Use this space to ask for tear sheets or other information.

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PLEASE THINK OF THE NEXT READER! When removing the first card from this sheet please remove it with care. One of the "pass-along" readers may wish to request bulletins, information, tear sheets or reprints. The redesigned "fire stop" in the perforations makes it easy to remove one card without disturbing the other.

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY—

Plant Engineering

308 EAST JAMES STREET

BARRINGTON, ILLINOIS

FOR BAR JOIST CONSTRUCTION—
NEW LOW-COST FIRE PROTECTION

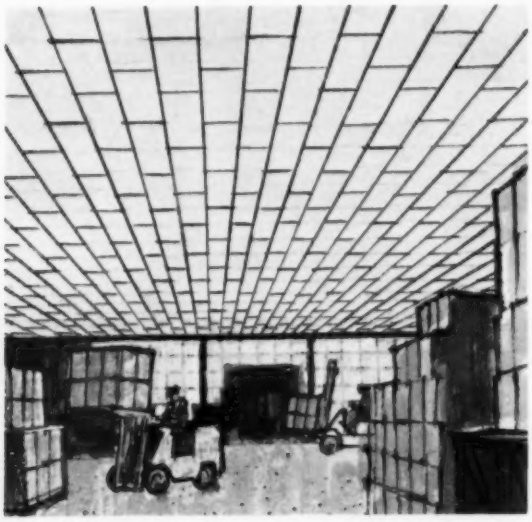
Armstrong Fire Guard Nailing Panel

INFORMATION AND SPECS
ON FOLLOWING PAGES

NEW FROM ARMSTRONG . . .

Fire Guard Nailing Panel to meet your need

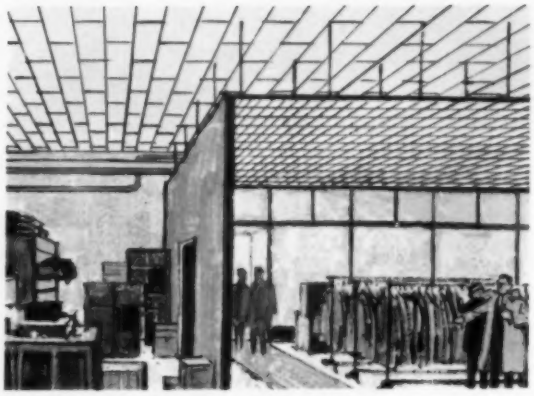
A fire-retardant mineral fiberboard ceiling material, Fire Guard Nailing Panel is designed to provide rated fire protection at low cost for many types of industrial and commercial construction. Easily installed, it eliminates the expensive delays of conventional "wet" methods of fireproofing.



TWO-HOUR ASSEMBLY RATING— THREE-HOUR JOIST PROTECTION

Rated construction of one-, two- or three-hour fire resistance is often required by local codes in basements, warehouses, factories, boiler rooms and similar areas where bar joist construction is frequently used. Fire Guard Nailing Panel has been specially developed for uses of this type. It offers both rated fire protection *and* fast, economical installation.

With concrete slab and open-web steel joist construction, Fire Guard Nailing Panel received an official two-hour assembly rating from Underwriters' Laboratories, Inc. (UL test R4340-1). When the UL test was continued past the three-hour mark, the ceiling of Fire Guard Nailing Panel still provided effective fire protection for the steel joists.



EXCELLENT FOR DOUBLE CEILING CONSTRUCTION

As the upper ceiling, Fire Guard Nailing Panel is attached directly to bar joists to provide necessary fire protection. A conventional acoustical ceiling may then be suspended over those areas of the building where appearance is a prime factor. For instance, a retail store may house both storage and selling areas under a common ceiling of Fire Guard Nailing Panel. Then a finished ceiling, such as Armstrong Travertone (T.M.), may be installed only over the selling area, to meet decorative and acoustical requirements. Future expansion of office and selling spaces can be easily accommodated by simply adding finished ceilings whenever they are required.

Building owners and managers will find Fire Guard Nailing Panel an economical method of providing fire protection in unleased areas of a building. Future tenants can select finished ceilings at the time of occupancy.

PRIMED SURFACE FINISH

The surface of Fire Guard Nailing Panel is a smooth primed and ironed paint finish that gives a clean, trim appearance. This surface also will provide an excellent base when an additional paint finish is desired.

for low-cost membrane fire protection

SAVES UP TO SIX WEEKS' CONSTRUCTION TIME

The delays in construction caused by conventional "wet" methods of fireproofing are completely eliminated with Fire Guard Nailing Panel. No extra moisture is introduced into the building. The large, lightweight, easy-to-handle panels go up quickly and easily. Construction time can be reduced up to six weeks.

EASY INSTALLATION

Installation is accomplished by attaching standard type nailing channels directly to bottom chords of steel bar joists. Fire Guard Nailing Panel is then nailed to the channels.

Staggered end joints of the Nailing Panels are reinforced at each intersection by a steel bridging clip.

To insure that installation will achieve the desired time-design rating, step-by-step installation specs are included with each bundle of material (see following page).

CONVENIENT SIZE

Nailing Panel is manufactured in 22½" x 64" x ⅝" size so that each unit consists of ten square feet. It is packed eight pieces (80 square feet) per bundle.

OVER

Specifications for new Armstrong Fire Guard Nailing Panel

MATERIAL

Membrane fire protection shall provide (two-hour, three-hour) protection for structural steel, as tested by Underwriters' Laboratories, Inc. Membrane fire protection shall consist of incombustible mineral fiberboard attached to standard type nailing channels.

a. Incombustible mineral fiberboard shall be Armstrong Fire Guard Nailing Panel as manufactured by the Armstrong Cork Company. Nailing panels shall be nominal 22½" x 64" x ⅝" in size and shall be factory-sanded with a primed and ironed paint finish. Nailing panels shall be incombustible and carry the Underwriters' Laboratories Fire-Retardant Classification label.

b. Nailing channels shall be fabricated from electrogalvanized steel of a minimum thickness of .020". Couplings for splicing the nailing channels shall be as recommended by the manufacturer of the nailing channel.

INSTALLATION

The fire-protective membrane shall be installed in strict accordance with the manufacturer's recommendations and in such a manner as to achieve the specified fire-retardant time-design rating.

a. Installation of nailing channel. The contractor shall furnish and install nailing channels. The nailing channels shall be attached to the bottom chords of steel bar joists (or to 1½" carrying channels) with double strand of #18-gauge tie wire or suitable-type nailing clips. Tie wires or clips should be placed at such intervals that the span of nailing channels does not exceed 48". The nailing channels shall be spaced approximately 16" on center at right angles to the supporting members. Nailing channels shall be spaced approximately 3" from walls paralleling the direction of the nailing channels. Approximately ¾" clearance shall be maintained between the ends of the nailing channels and the walls perpendicular to the direction of the nailing channels. Where adjacent channels are spliced together, clearance of approximately ½" shall be maintained between ends of nailing channels.

b. Installation of nailing panels. The contractor shall furnish and install Armstrong Fire Guard Nailing Panels. The nailing panels shall be applied with the long dimension at right angle to the nailing channels, staggering the end joints so they fall between the nailing channels in each succeeding course. Panels are attached to the nailing channels at each bearing with a 1⅛" annular steel nail, spaced approximately 6" on center. Diameter of nailheads shall be approximately ⅜". Staggered end joints of the nailing panels shall be reinforced by inserting a 20-gauge steel bridging clip at each intersection.

FOR INFORMATION on the availability of new Armstrong Fire Guard Nailing Panel contact your Armstrong District Office or write direct to Armstrong, 4200 Richard Road, Lancaster, Pa.

ARMSTRONG OFFICES

ATLANTA, GA.
727 West Peachtree St., N.E.
TRinity 5-7201

BOSTON, MASS.
200 First Avenue, New England Industrial Center, Needham Heights 94. Hillcrest 4-5700

CHARLOTTE, N. C.
1127 East Morehead Street.
EDison 3-7741

CHICAGO, ILL.
6535 West Irving Park Road.
PEnsacola 6-9440

CINCINNATI, OHIO
1057 Meta Drive. ELmhurst 1-3330

CLEVELAND, OHIO
2975 Superior Avenue. MAin 1-7900

DALLAS, TEXAS
2727 Oak Lawn Avenue.
LAkeside 6-7468

DENVER, COLO.
35 West 5th Avenue. CHerry 4-0543

DETROIT, MICH.
Free Press Building, 321 Lafayette Ave., West. WOodward 3-8322

KANSAS CITY, MO.
500 West 26th Street. Victor 2-9154

LOS ANGELES, CALIF.
5983 E. Smithway Street.
RAymond 3-9381

MINNEAPOLIS, MINN.
4539 Hiawatha Ave. PArkway 1-2447

NEW YORK, N. Y.
60 West 49th Street, Rockefeller Center. JUdson 2-3700

PHILADELPHIA, PA.
301 City Line Avenue, Bala-Cynwyd. TEnnyson 9-6640

PITTSBURGH, PA.
24th St. & Allegheny River.
ATlantic 1-7474

ST. LOUIS, MO.
1919 Hampton Ave. Mission 7-3200

SAN FRANCISCO, CALIF.
1814 Ogden Drive, Burlingame.
OXford 2-1833

SEATTLE, WASH.
221 Minor Ave., North. MAin 3-2772

CANADA
6911 Decarie Boulevard,
Montreal 29, Quebec

Armstrong FIRE GUARD NAILING PANEL

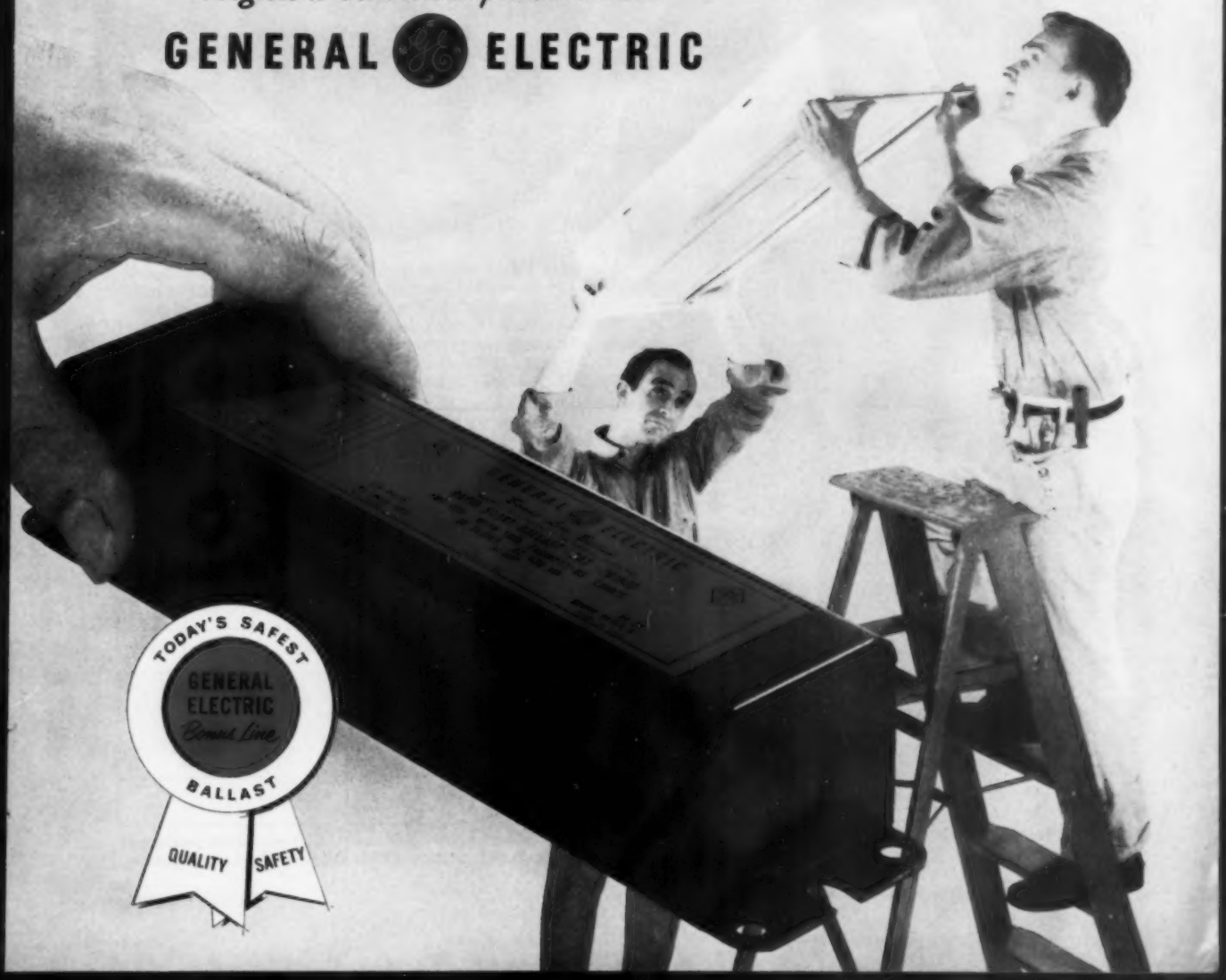
Your lighting projects require the *safest* fluorescent ballasts you can specify . . . General Electric Bonus Line*. These ballasts are designed to protect against leaking, smoking, burning—*all* potential hazards or annoyances at end of life. They feature a unique, non-resetting thermal protection system—better than the best fusing—for unmatched, incident-free operation throughout their full, useful life. Put the fullest measure of lighting protection into your buildings. Write premium-quality General Electric Bonus Line ballasts into your lighting specifications.

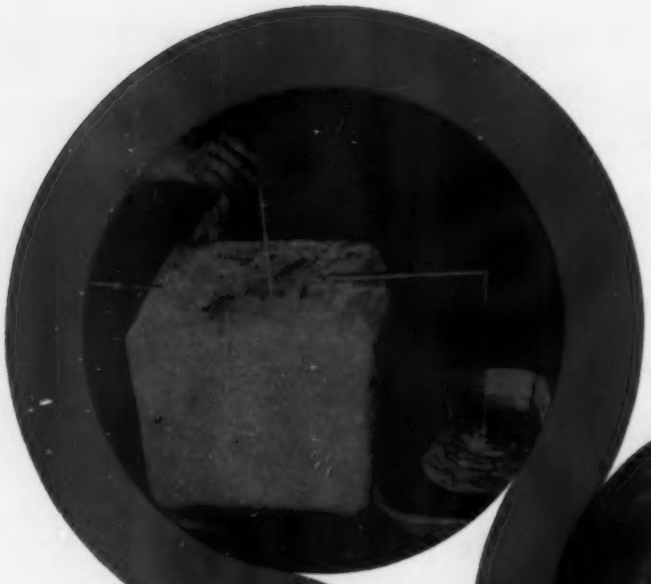
*Trade-mark of General Electric Company

For a detailed engineering report on Bonus Line ballasts, contact your G-E Sales Engineer or write Section 403-03, General Electric Company, Danville, Illinois.

Progress Is Our Most Important Product

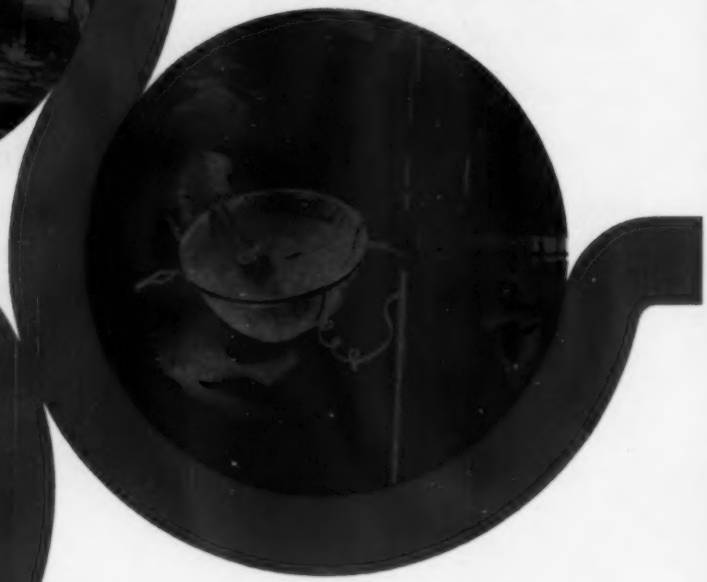
GENERAL ELECTRIC





Mobilplex EP grease has good pumpability over wide ranges of temperature and shear rates. Here, Mobilplex EP is pumped through a 24-foot coil of ⅜" tubing frozen in ice at 15 F . . . remains pumpable, permits continuous delivery even at critical pumping rate.

Mobilplex EP resists both water wash and runout caused by heat. In this demonstration, an immersion heater is used to boil water in a conventional mesh vegetable strainer coated with Mobilplex EP. Grease maintains a water-tight film even under these adverse conditions.



Mobilplex EP gives extra protection against wear under heavy and shock loads. Here, two split "bearings" consisting of V-shaped bushings are clamped under equal pressure on a polished steel shaft. The front bearing is lubricated with Mobilplex EP; the rear bearing with a high quality non-EP grease. When bearings are reciprocated in opposite directions, the shaft turns with the rear bearing, indicating frictional resistance is greatest at this point.

EVALUATION SUMMARY
MOBILPLEX EP (M) and 5 Leading Competitive EP Greases (A,B,C,D,E)

PROPERTY EVALUATED	RATING			
	Excellent	*Good*	*Fair*	*Poor*
Heat Resistance	M	A	C,D,E	B
Service Performance	M	A,C,E	B,D	
Extreme Pressure	M,A,C	B,D,E		
Anti-Wear	M,A	B,C	D,E	
Rust Protection		M,B,C, D,E		A
Water Resistance		M,B,C	A,D,E	
Handling Properties		M,A,B C,D,E		
Controlled Bleeding		M,A,C	B,D,E	
Non-staining		M	A,B, D,E	C

This chart summarizes results of an extensive evaluation program at Mobil Research. For complete details ask your Mobil representative.

◄ Circle 523 on postcard, page 33

The Multi-Service Grease with unique Calcium EP Complex. Never before in a single lubricant such a wide range of use . . . such a margin of superiority . . . such a potential for maintenance savings!*

Versatility unparalleled...

Mobilplex ep

A product of Mobil research . . . Mobilplex EP . . . a Multi-Service extreme-pressure grease far superior in quality and range of applications to any multi-purpose grease available.

Mobilplex EP, with a unique Calcium EP Complex, provides maximum protection against wear, rust, washout and heat. Because of its greater versatility, Mobilplex EP goes further than competitive extreme-pressure greases in simplifying your lubricant application, storage and purchasing practices. This new-type lubricant has given industrial machines greater protection while replacing as many as seven other greases. Mobilplex EP has all of the advantages usually associated with EP greases—as well as excellent storage, structural and oxidation stability.

Examination of the Socony Mobil evaluation summary at left shows that in comparison with five competitive extreme-pressure lubricants Mobilplex EP is the only grease excellent or good in every grease quality tested. No wonder aluminum and steel mills, metalworking shops, cement plants, and the chemical and rubber industries are reporting dramatic success with Mobilplex EP.

For full details contact your local Mobil representative, or write Mobil Oil Company, 150 East 42nd Street, New York 17, New York.

*Multi-Service means excellent for all types of anti-friction and plain bearings under various operating conditions up to temperatures in the range of 300 F. and for all types of dispensing equipment.

For a descriptive brochure and specific recommendations, cut out and mail on your letterhead.

Mobil Oil Company, Room 2057B

Gentlemen: Re: Mobilplex EP Grease Ad. Please have technical representative call to discuss:

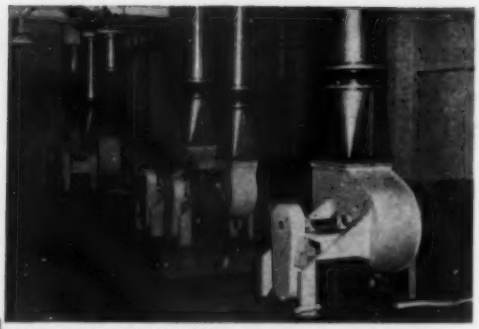
- ☐ Performance results.
- ☐ A specific grease lubrication problem involving water_____ caustic_____ acid_____ heat_____.
- ☐ Reducing the number of greases in my plant.

Mobil

Proved Petroleum Products . . . Available with a Mobil Program of Correct Lubrication

Circle 524 on postcard, page 33

HEALTHY 'BUFFALO' ATMOSPHERES HELP ...PFIZER'S FIGHT



BELTED VENT SET INSTALLATION: Three Buffalo Forge fans exhausting from Fermentation Labs at 1260 CFM... three other units exhausting from Chromatography Labs at 230, 650, and 1650 CFM respectively.

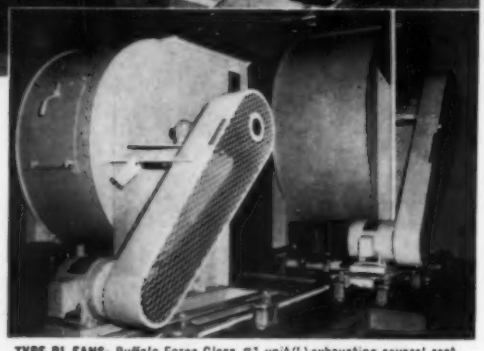
New Medical Research Laboratories of Chas. Pfizer and Co., Inc. at Groton, Connecticut, a modern three-story facility staffed by more than 400 scientists, technicians and supporting personnel engaged in such specialized fields as medicinal chemistry, chemotherapy, macrobiology and fermentation research. Air conditioned and ventilated throughout with Buffalo Forge equipment.

In the world of medicine, purity of ambient air is vitally important to purity of product...and the health of research workers.

That means that impure and contaminated atmospheres must be exhausted and replaced by clean, tempered air ... continually, dependably, and at installation and maintenance costs that contribute to maximum research capability.

Complete air conditioning systems and supply and exhaust fans by Buffalo Forge fill these requirements not only at Pfizer, but in countless commercial, industrial, and marine applications around the world.

A call to your resident Buffalo Forge representative ... or the address below... will place sound engineering recommendations at your disposal. Plus the widest range of air and liquid handling equipment in the industry.



TYPE BL FANS: Buffalo Forge Class #1 unit (L) exhausting several rest rooms at 4725 CFM... another Class #1 exhausting office areas and non-chemical labs at 9700 CFM.

AIR MAKE-UP SYSTEM AND EXHAUST SYSTEMS: Buffalo Forge Type PC unit (center rear) distributing 50° tempered air to six labs at 10,800 CFM... seven Belted Vent Sets exhausting from laboratory hoods at 2900, and 1500 CFM.

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

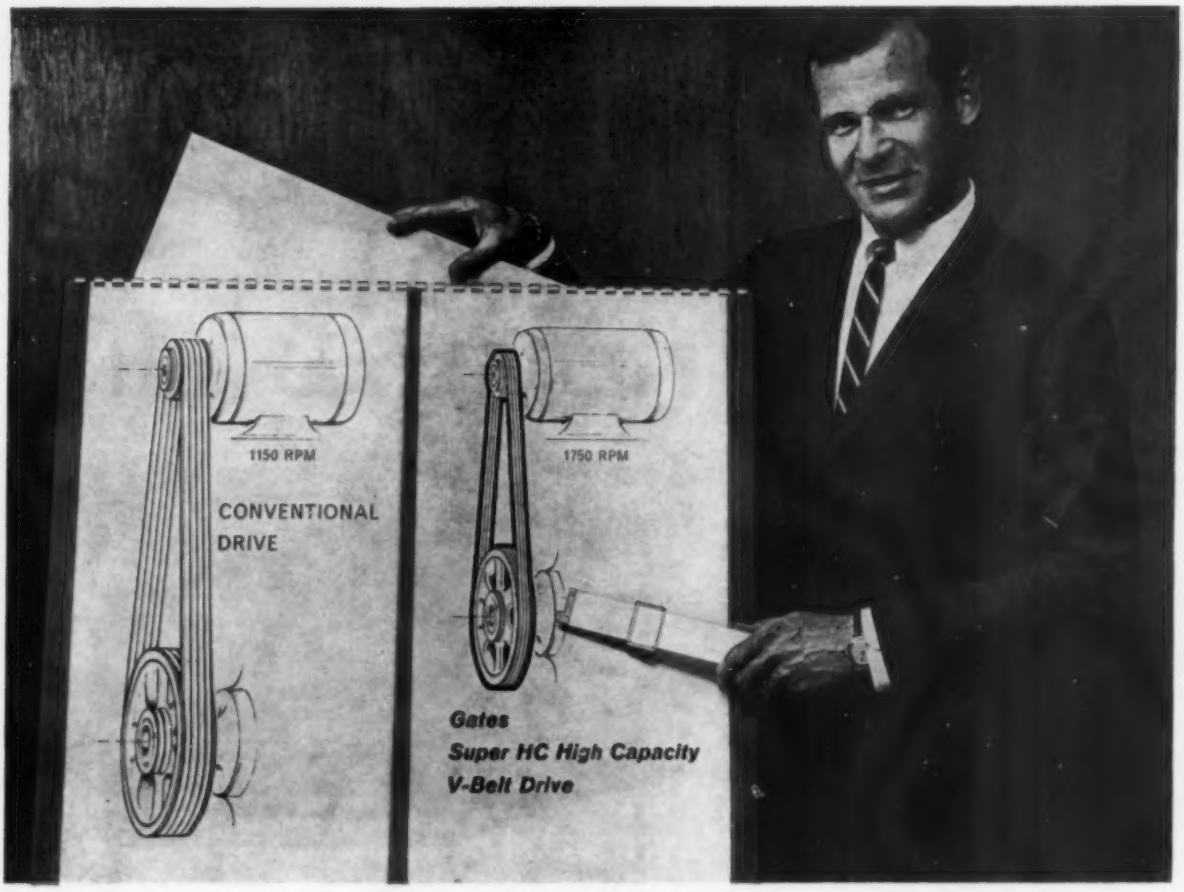
'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

Circle 525 on postcard, page 33



How Gates Super HC Drives can save space, weight, money on machines in your plant

Ask your local Gates Man to design a drive for your machine two ways: A conventional V-belt drive and a Gates Super HC High Capacity Drive. A quick comparison will show you that the new Gates Drive costs up to 20% less than a conventional V-belt drive, weighs about 20% less and can handle your power requirement in ⅔ to ½ the space.

These advantages are possible because of exclusive, basic changes in V-belt shape and construction that permit this drive to transmit up to 3 times the horsepower of a conventional V-belt drive in the same space.

Manufacturers everywhere have standardized on the Gates Super HC Drive—the first and most advanced High Capacity Drive. It is your best assurance that your power transmission unit will remain up-to-date for many years to come.

The Gates Man, located near you, has had long, intensive training and experience in drive design. *Ask your nearby Gates Distributor for his help when you have a drive problem.*

The Gates Rubber Company, Denver, Colorado

BP54H

Gates Super HC Drive Gives you these benefits:

- Saves up to 50% in drive space.
- Reduces drive weight 20% and more.
- Cuts drive costs as much as 20%.
- Reduces bearing load, increasing bearing life.
- Guards can be smaller, lighter weight.
- Belt speed up to 6000 ft/min possible without dynamic balancing.
- Less costly, higher speed motors can often be used.
- Jackshafts and outboard bearings can sometimes be eliminated.

Exclusive design features include: A Precisely Engineered Arched Top, Concave Sides, Flex-Weave Cover, super strength tensile construction.

Gates

Building the future on 50 years of progress

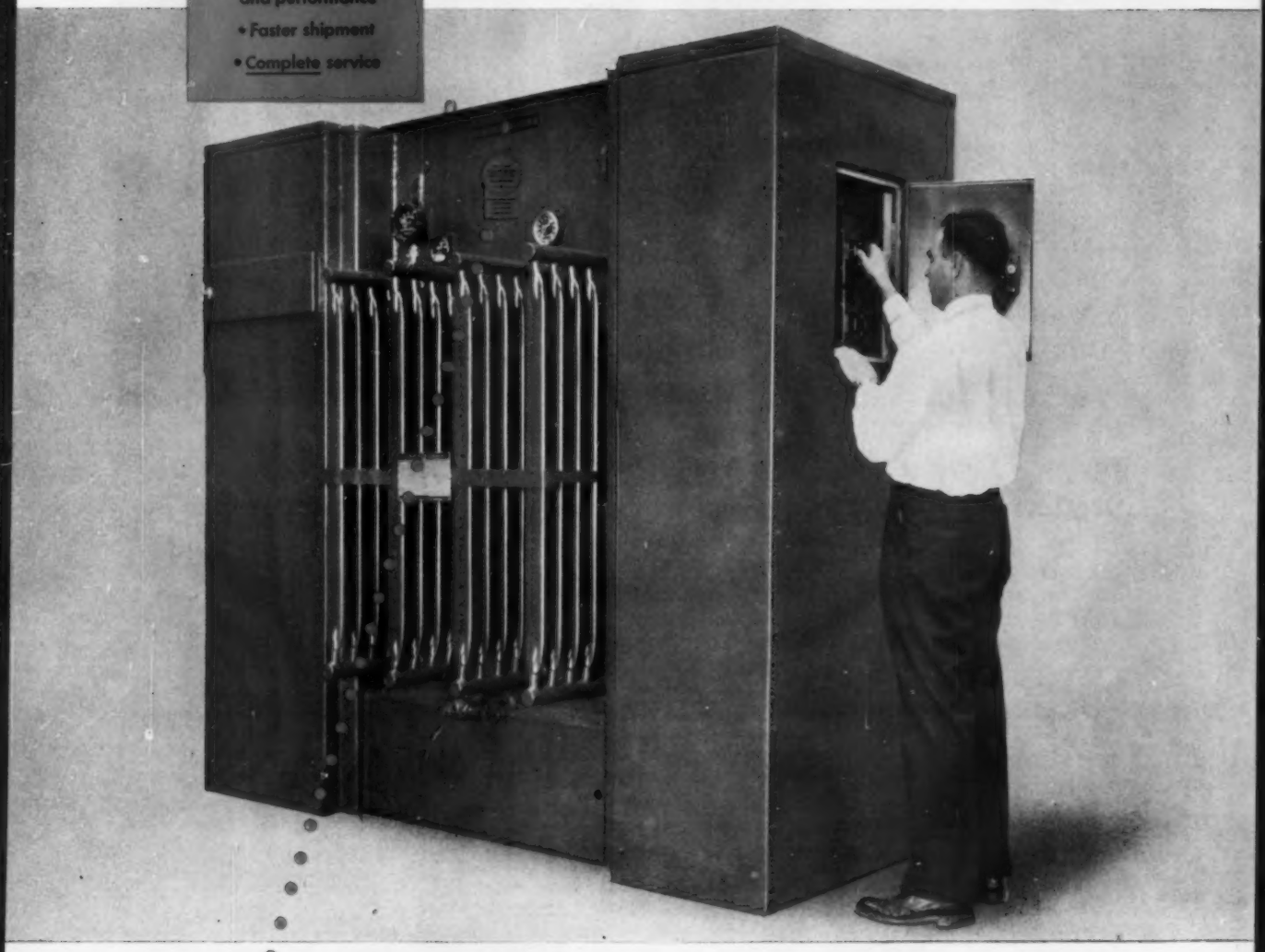
Gates Super HC V-Belt Drives

Circle 526 on postcard, page 33

FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
- Complete service

NOW... a wider



SYMBOL OF FULL VALUE

With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

choice of power packages

General Electric offers efficient, co-ordinated Integral Distribution Centers for every load application

Whatever your load requirements, General Electric offers an Integral Distribution Center that is just right for the job. Five incoming, three transforming, and five outgoing sections are available to provide a versatile line of power packages for any application. The result . . . a "customer-designed" combination saving you the cost of special design engineering.

And, since each Integral Distribution Center is shipped in a *single*, pre-wired package*, installation costs are lower.

Choose from over 50 power packages

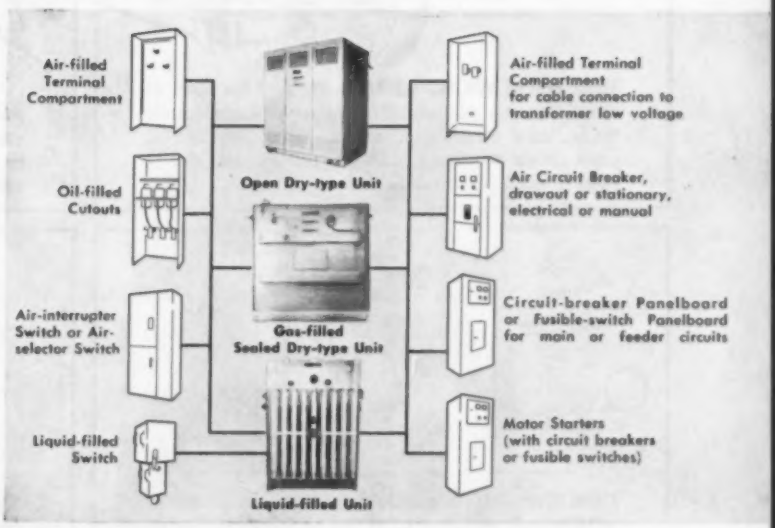
General Electric offers more than 50 distribution-center combinations . . . with ratings from 112½ to 2500 kva. Here are the "building blocks" that make these combinations possible:

- **Five high-voltage terminations:** air switches with stored-energy mechanism (2 types), oil-filled cutouts, liquid-filled switches, or a full-length cable-termination compartment.
- **Three transforming sections:** liquid-filled (oil or Pyranol†, 112½-2500 kva), open dry-type, or gas-filled sealed dry-type (300-2500 kva).
- **Five low-voltage terminations:** AK circuit breaker, full-length terminal compartment, molded-case circuit-breaker panelboard, fusible disconnect-switch panelboard, motor starters.
- **Optional features** such as metering, relaying.
- **Space-saving size:** newly redesigned packages such as the compact 300- and 500-kva units can save as much as 45% of the valuable space required by earlier models.

For further information, call your General Electric Sales Engineer, or write for Bulletin GEA-7222, General Electric Co., Schenectady, N. Y.

*Air switches shipped separately 417-09

†Reg. Trade-mark of General Electric Co.


Air-filled Terminal Compartment
Oil-filled Cutouts
Air-interrupter Switch or Air-selector Switch
Liquid-filled Switch
Open Dry-type Unit
Gas-filled Sealed Dry-type Unit
Liquid-filled Unit
Air-filled Terminal Compartment for cable connection to transformer low voltage
Air Circuit Breaker, drawout or stationary, electrical or manual
Circuit-breaker Panelboard or Fusible-switch Panelboard for main or feeder circuits
Motor Starters (with circuit breakers or fusible switches)

WIDE VARIETY of combinations is possible because of the General Electric distribution-center "building blocks" illustrated here.

ALPHOLITE‡ INSULATION provides inorganic dielectric barrier for all dry-type units.

STURDILY DESIGNED liquid-filled internal structure gives transforming section longer life.

‡Trade-mark of General Electric Co.

Progress Is Our Most Important Product

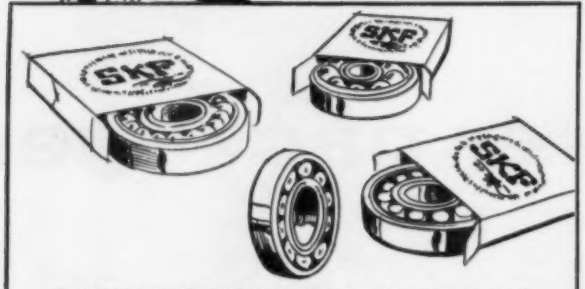
GENERAL ELECTRIC

Circle 527 on postcard, page 33

DISTRIBUTOR DAN, the SKF bearing man, shows

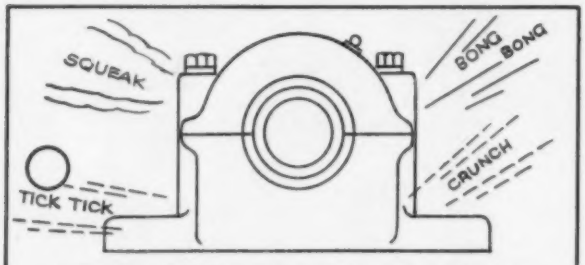
HOW TO CHECK BEARINGS DURING RUN-IN

—to prevent damage and downtime later!

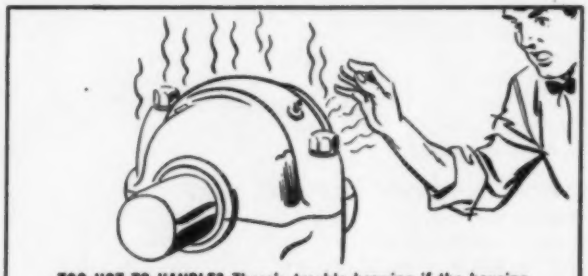


THINK BEFORE YOU INSTALL THEM. The first few hours of operation are the most critical in a bearing's life. So, operate the bearing at reduced speed and load during run-in. Bearing run-in periods vary from a few hours to a few weeks, but 24 hours is usually sufficient.

NOISE CAN BE A SYMPTOM. A soft, purring sound is all you should hear from a bearing—if it's operating correctly. Check by placing the blade of a screwdriver and listening at the handle. Any other noise means trouble sooner or later.



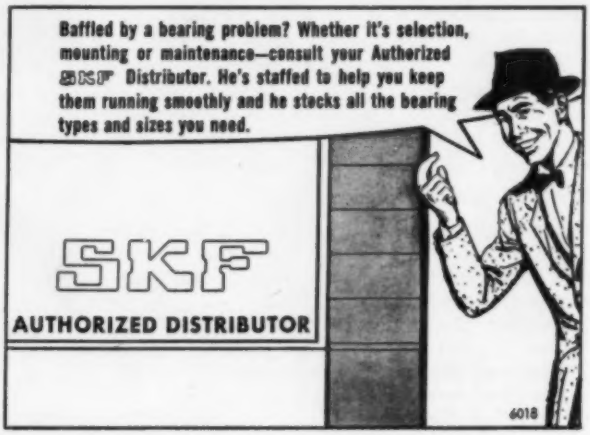
KNOW YOUR NOISES. Squeaking means inadequate lubrication. Metallic tones indicate shaft or housing interference or improper adjustment. Smooth, clear tones tell of marks in the stationary raceway. Intermittent noises indicate a damaged ball. Crunching means dirt.



TOO HOT TO HANDLE? There's trouble brewing if the housing feels excessively hot. High temperature usually indicates overlubrication or use of a lubricant with too high viscosity. It can also be a sign of excessive axial or radial preloading, misalignment, tight-fitting seals, or rubbing.

PREVENT TROUBLE BY DOUBLE-CHECKING. Always check the bearing after the critical run-in period. Examine the lubricant. If it's dirty, change it. Check the seals for signs of wear or damage. A few minutes spent double-checking now eliminates chances of costly damage and downtime later.

Baffled by a bearing problem? Whether it's selection, mounting or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

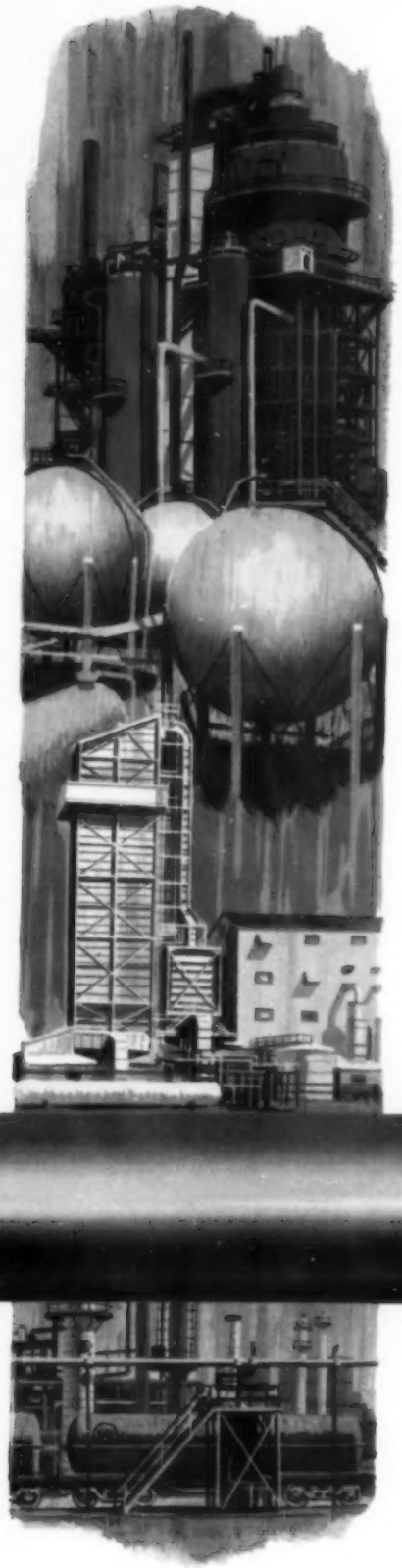


SKF MOTION ENGINEERING

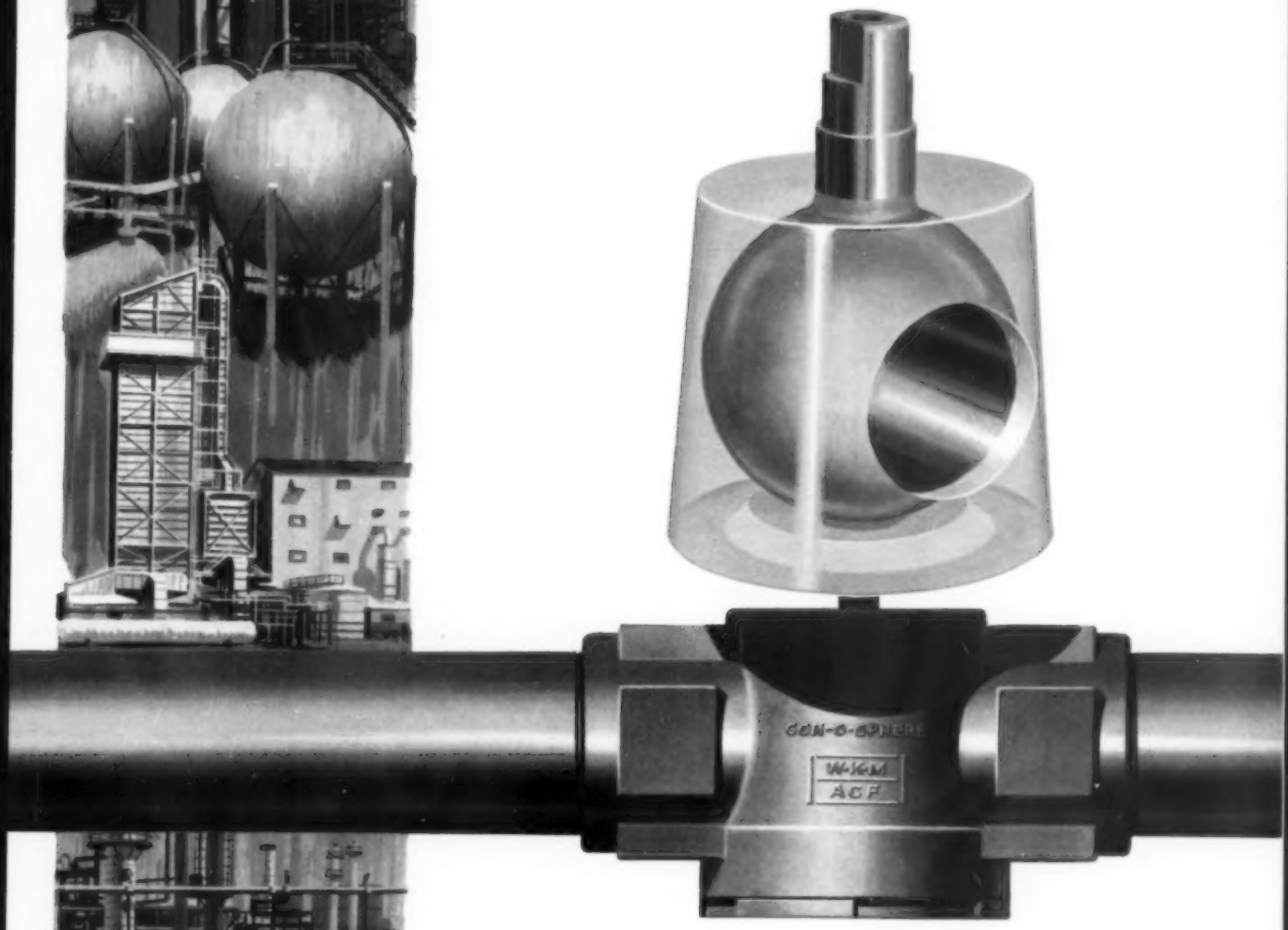
Advanced ball and roller bearing technology

Circle 528 on postcard, page 33

Circle 529 on postcard, page 33 ➔



This Revolutionary Sealing Capsule Gives You Maximum Possible Sealing Ability Plus On-Flow Seal Adjustment

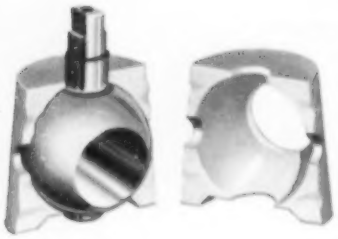


CON-O-SPHERE™
BALL VALVE

When So Much Depends on a Valve...Specify

W-K-M
ACF

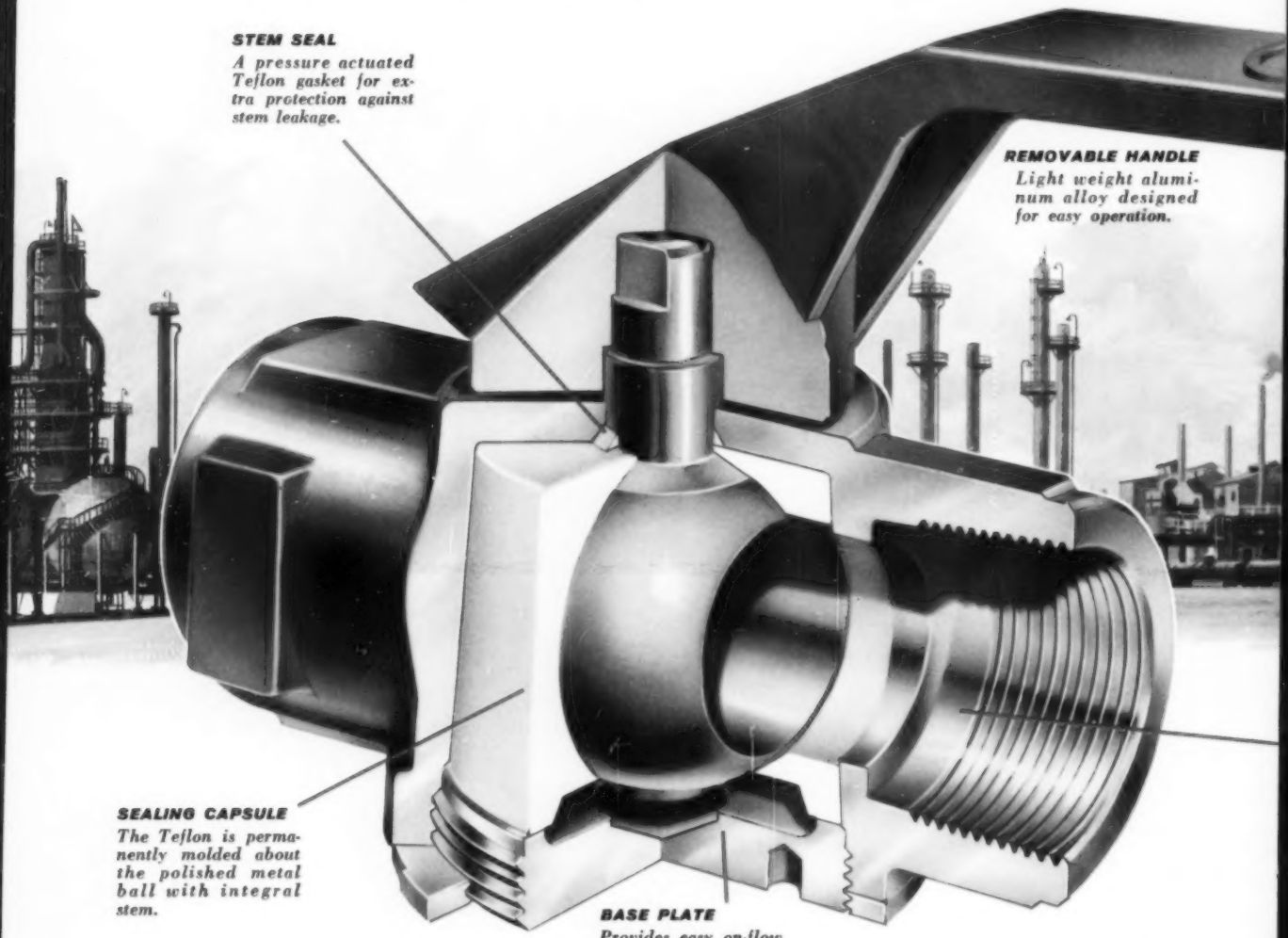
CON-O-SPHERE'S Sealing Capsule Makes Possible



This revolutionary sealing capsule consists of a polished metal ball molded permanently within a solid block of Teflon. Because of the natural slipperiness and resiliency of Teflon, the confined ball turns easily and smoothly although there is no clearance between the ball and the Teflon. The surface of the ball provides a positive seal against the inner surface of the Teflon, thus giving the maximum possible sealing area. When the cone-shaped sealing capsule is placed into its mating cavity in the valve body, and forced into position tightly by means of the screw-in base plate, the outside surface of the Teflon provides a seal with the smoothly finished metal of the body. Result—a valve having the maximum sealing ability ever achieved!

ON-FLOW SEAL ADJUSTMENT is easily accomplished by tightening the base which forces the resilient Teflon sealing capsule to fill the body cavity to prevent any leak-through, and also forces the Teflon into more intimate contact with the ball. The same adjustment likewise provides a tighter stem seal by forcing the Teflon stem seal gasket tightly against the top of the body. Thus tightening the base plate, which can be done while the valve is in service, makes possible complete adjustment of all sealing surfaces.

PLUG-IN REPLACEMENT OF THE SEALING CAPSULE, if ever necessary, takes but a few minutes, permitting the fastest and most economical ball valve overhaul on record. The Con-O-Sphere is ideal for use as a panel mounted instrument valve. They are easily adjusted or repaired without removing from the panel and are drilled and tapped for easy mounting.


STEM SEAL
A pressure actuated Teflon gasket for extra protection against stem leakage.
REMOVABLE HANDLE
Light weight aluminum alloy designed for easy operation.
SEALING CAPSULE
The Teflon is permanently molded about the polished metal ball with integral stem.
BASE PLATE
Provides easy on-flow adjustment of both line and stem seals. Quickly removed for fast plug-in replacement of Sealing Capsule and stem seal.

© 1961 ACF Industries, W-K-M Division

Positive, Total-Contact Sealing

FULLY PROTECTED SEALING AREA. The sealing areas of the Con-O-Sphere Ball Valve are fully protected from the flow of the lading both in the open and closed positions. This, plus the fact that the Con-O-Sphere has the largest reserve of sealing material of any ball valve ever made offers the user an extremely long service life with little or no maintenance.

ECONOMICAL TO BUY AND MAINTAIN... You pay no premium for this revolutionary new valve. And its low purchase price is made even more attractive by the negligible cost of its upkeep. It *never needs lubrication* and it takes only a few minutes to adjust or replace the sealing capsule.

UNEQUALLED VERSATILITY. The Con-O-Sphere is available in ductile iron, steel, aluminum, stainless steel and bronze and consequently is adaptable to an extremely wide range of applications. The working pressure range from vacuum to 1440 psi, and size range from ⅛″ through 2″ make it applicable to a large percentage of process plant small valve needs. It operates efficiently over a wide temperature range.

VALVE BODY
Screwed, flanged or as otherwise specified. Standard Materials are ductile iron, carbon steel, stainless steel, aluminum and bronze.

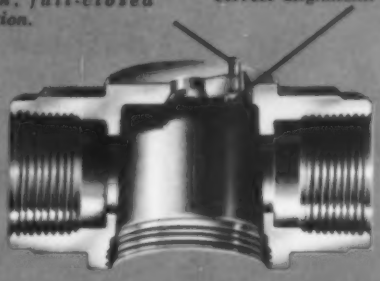
THE CON-O-SPHERE BALL VALVE is ideal for such difficult services as handling acetone, aviation fuel, naphtha and coal tar solvents, lime and soda ash slurry, helium, chlorinated solvents, liquid butadiene, and riboflavin. It finds applications in all process plants where efficient handling of gases, liquids, and viscous or abrasive ladings is vital. It is ideal for welding in the line because the Teflon sealing capsule is so easy to remove and replace. The complete range of sizes and pressures is charted on the back page of this folder.

HANDLE

HANDLE SET SCREW

HANDLE STOP
Locates ball in full-open, full-closed position.

LOCATING PIN
Holds the sealing capsule stationary and in correct alignment.



BODY WITH LOCATING PIN

TEFLON* STEM SEAL

UNITIZED TEFLON-AND-BALL SEALING CAPSULE

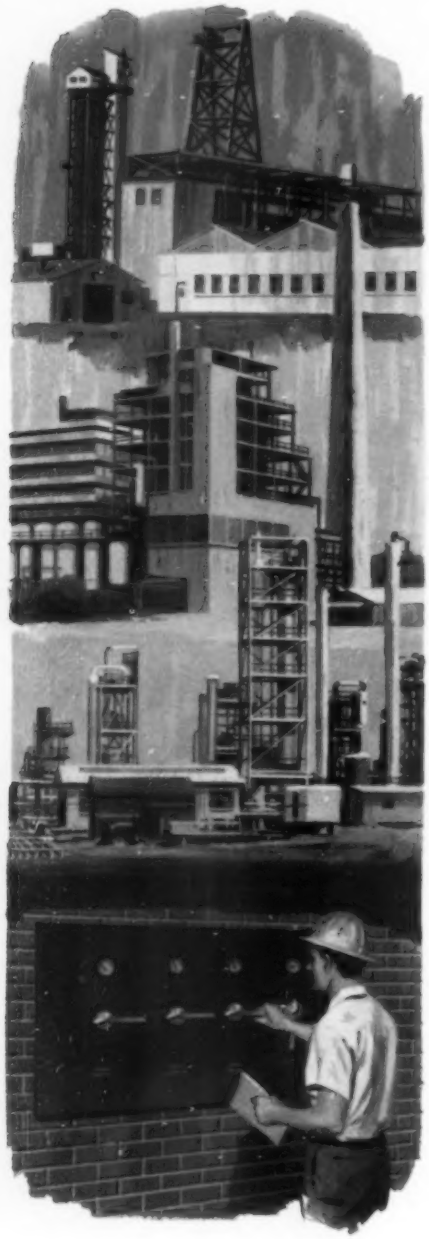
BASE PLATE

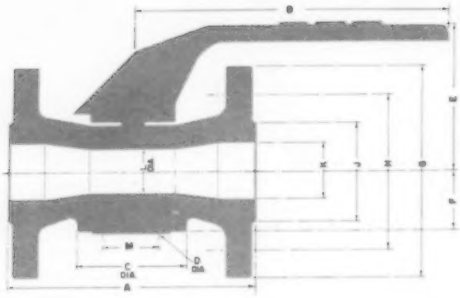
LOCK NUT

This unique ball valve consists of only a handful of parts. Such a simple, basic design makes for long life and efficient trouble-free operation. First cost is low and maintenance is practically negligible. The entire valve may be disassembled and reassembled in just a few minutes, on or off the line.

*Du Pont's Tetrafluorethylene resin

CON-O-SPHERE BALL VALVE



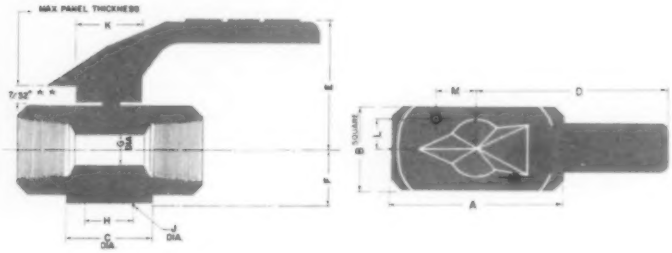


Size Flange	A	B	C	D**	E	F	G	H	J	K	L	M	N*
½" —150#	4¼	3½	1¼	5/16	2½	25/32	3½	2 3/8	1 3/8	5/8	7/16	5/8	4-½
¾" —150#	4 5/8	6½	1 11/16	5/16	2¾	31/32	3 7/8	2¾	1 11/16	13/16	5/8	7/8	4-½
1" —150#	5	6½	2¼	¼	2 29/32	1 3/16	4¼	3 1/8	2	1 1/16	13/16	1	4-½
1¼" —150#	5½	6½	2½	¼	3 1/32	1 5/16	4 5/8	3½	2½	1¼	1	1¼	4-½
1½" —150#	6½	10	3	5/16	4 3/16	1 5/16	5	3 7/8	2 7/8	1 5/8	1¼	1½	4-½
2" —150#	7	10	3½	5/16	4 5/16	1 13/16	6	4¾	3 5/8	2 1/16	1½	2	4-5/8

*N = NUMBER AND SIZE OF FLANGE BOLTS **D = DIA. OF SPANNER WRENCH HOLES

Size Flange	A*	B	C	D	E	F	G	H	J	K	L	M	N*
½" —300#	4¼	3½	1¼	5/16	2½	25/32	3 3/4	2 5/8	1 3/8	5/8	7/16	5/8	4-½
¾" —300#	4 5/8	6½	1 11/16	5/16	2¾	31/32	4 5/8	3¼	1 11/16	13/16	5/8	7/8	4-5/8
1" —300#	5	6½	2¼	¼	2 29/32	1 3/16	4 7/8	3½	2	1 1/16	13/16	1	4-5/8
1¼" —300#	5½	6½	2½	¼	3 1/32	1 5/16	5¼	3 7/8	2½	1¼	1	1¼	4-5/8
1½" —300#	6½	10	3	5/16	4 3/16	1 5/16	6 1/8	4½	2 7/8	1 5/8	1¼	1½	4-¾
2" —300#	7	10	3½	5/16	4 5/16	1 13/16	6½	5	3 5/8	2 1/16	1½	2	4-5/8

*ASA 150# FACE TO FACE (ASA 300# FACE TO FACE AVAILABLE ON REQUEST)



Size	A	B	C	D	E	F	G	H	J*	K	L	M
⅛ NPT	2	1	1	3	1¾	11/16	3/16	3/8	1/8	7/8	3/8	5/8
¼ NPT	2	1¼	1¼	3	1 13/16	13/16	7/16	5/8	3/16	7/8	7/16	5/8
⅜ NPT	2 5/16	1¼	1¼	3	1 13/16	13/16	7/16	5/8	3/16	7/8	7/16	5/8
½ NPT	2 11/16	1¼	1¼	3	1 13/16	13/16	7/16	5/8	3/16	7/8	7/16	5/8
¾ NPT	3 1/8	1 5/8	1 11/16	6½	2 13/16	1	5/8	7/8	3/16	1 5/8	21/32	1 1/8

*J = DIA. OF SPANNER WRENCH HOLES **⅛ NPT THROUGH ¾" NPT ONLY

Size	A	B	C	D	E	F	G	H	J*
1 NPT	3 7/8	1 5/8	2 5/16	6½	2 15/16	1 3/16	13/16	1	¼
1¼ NPT	4 11/32	2	2½	6½	3 1/16	1 5/16	1	1¼	¼
1½ NPT	4¾	2 5/16	3	10	4 1/16	1 5/16	1¼	1½	5/16
2 NPT	5 3/8	2¾	3½	10	4 5/16	1 13/16	1½	2	5/16

VALVES LARGER THAN ¾" DO NOT HAVE PANEL MOUNTING HOLES

W-K-M
DIVISION

ACF INDUSTRIES

Houston, Texas
Mailing Address: P. O. Box 2117
Phone: CApitol 7-8211 • TWX: Stafford, Texas, 520

PRINTED IN U. S. A.

HIGH CONTENT TEFLON* LATTICE BRAID PACKING...

now at regular packing prices!

Garlock Teflon-Impregnated LATTICE BRAID† Packing is a natural choice for leakproof operation of centrifugal and rotary shafts, valve stems, expansion joints, reciprocating rods, rams, plungers.

An exclusive Garlock manufacturing technique now offers Teflon-Impregnated LATTICE BRAID Packing** for approximately 40% less than ordinary Teflon packing . . . yet this superior new packing contains *more than 30% Teflon by actual weight.* Teflon powder is thoroughly sintered prior to treatment by a unique Garlock process, giving greater stability under temperature changes (−90° to +500°F). Outstanding resistance to glazing. Minimum swell, because Teflon is non-absorbent. Reduced friction and wear, because Teflon is virtually "frictionless." Excellent resistance to chemicals and corrosives.

And LATTICE BRAID construction affords greater strength, longer life, lower maintenance cost. Each strand of treated yarn is interwoven at a 45° angle through the packing body. Completely integrated structure for maximum strength. No single outer braid to wear through. Holds together much longer. Once properly installed, further gland adjustment is usually unnecessary.

Available in two types for efficient, low-cost sealing under all conditions:

GARLOCK 5875 Packing of Teflon-Impregnated WHITE Asbestos for corrosive and strong chemical service (except strong mineral acids and caustics). Withstands neutral and alkaline water, weak acid and caustic solutions. Edible liquids, paper pulp and other products where non-contamination is required. Gasoline, oils—cold and hot (including tar, asphalt, creosote).

GARLOCK 5881 Packing of Teflon-Impregnated BLUE Asbestos specifically designed for strong acids and caustics. Also resists alcohol, lime solutions, acid sludge, waxes, chlorine, dry solvents. Withstands high pressure steam cleaning. Proved non-nitratable in laboratory test.

Enjoy fast delivery from warehouse stock. Both styles immediately available in sizes from ¼″ to ⅝″ in $\frac{1}{16}$″ increments and ¾″ to 1″ in ⅛″ increments in spool or reel form. For more information, contact nearest of 26 Garlock sales offices and warehouses throughout the U.S. and Canada. Or, write for Catalog AD-185, Garlock Inc., Palmyra, N.Y.

GARLOCK

Canadian Div.: Garlock of Canada Ltd. **Plastics Div.:** United States Gasket Company. **Order from the complete line** of quality Garlock products . . . Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Stock and Parts.

*Du Pont Trademark **Patent Applied For †Registered Trademark

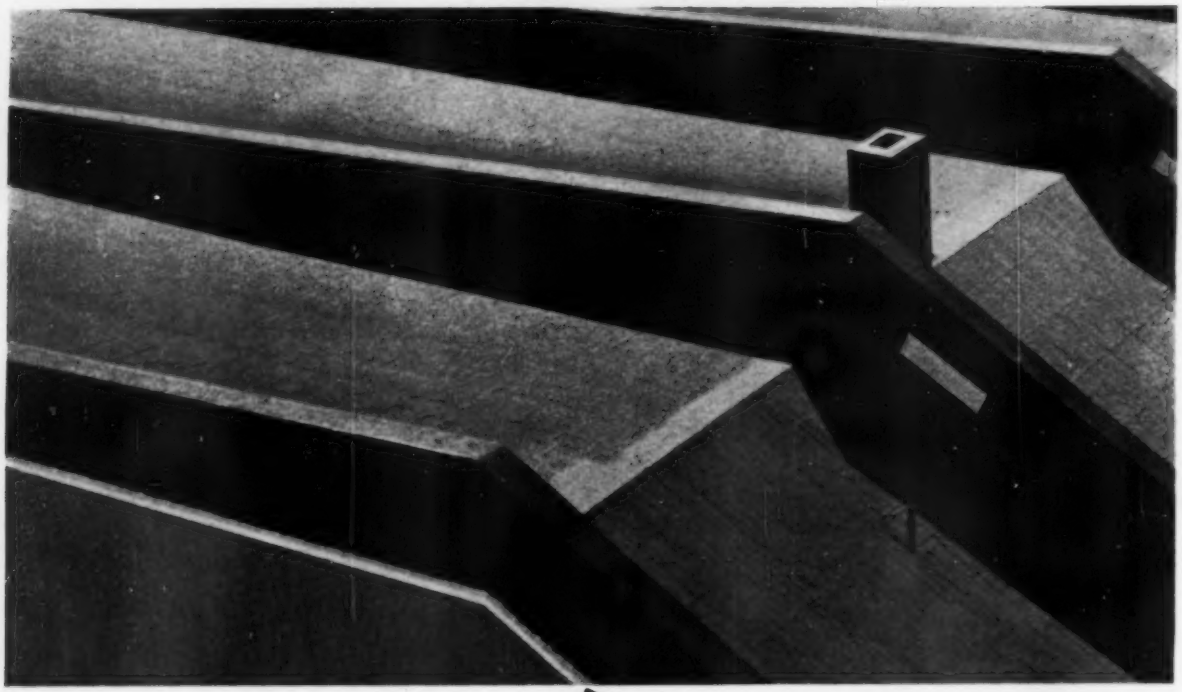
Circle 830 on postcard, page 33

THERE'S A JOHNS-MANVILLE SPECIFICATION FOR EVERY ROOF INCLINE

J-M smooth surface asbestos built-up roofs

save on dead weight, pay off in longer roof life

AQUADAM®
SMOOTH SURFACE BUILT-UP ROOF — DEAD LEVEL TO ¼" PER FOOT



¼" TO 6" PER FOOT — **FLEXSTONE®** SMOOTH SURFACE BUILT-UP ROOF

At left in the photograph above, you see an Aquadam Smooth Surface Built-Up Roof, which combines the bitumen *Aquadam* with J-M Asbestos Felts. Aquadam, especially developed for dead-level roofs, has the best features of coal tar pitch and of asphalt, without their weaknesses.

On your right in the photograph, the steeper incline requires a Flexstone Smooth Surface Built-Up Roof, which combines Standard 190 Asphalt with J-M Asbestos Felts. These felts contain a minimum of 85% asbestos fibre, each fibre as fine as silk, yet strong as steel. This high content of fibred stone means no gravel or slag is needed.

Both these J-M smooth-surface specifications make it possible to eliminate the weight of slag or gravel (from 300 to 400 lbs. per square) from the roof. And this saving in roof weight suggests possible economies in building construction. Flexstone and Aquadam roofs offer easy application . . . lower upkeep, easy inspection . . . and proven durability in years of service.

These are only two of the many roof specifications available to you. And if you're faced with an unusual situation on which you want advice, just call your local J-M Representative. For further details, write to Johns-Manville, Box 158, Dept. PE-1061, New York 16, N. Y. In Canada, address Port Credit, Ontario. Offices throughout the world. Cable address: Johnmanvil.

JOHNS-MANVILLE

JOHNS MANVILLE JM PRODUCTS

Circle 531 on postcard, page 33

NEW FROM BURKAY... Two Storage-Type Water Heaters!

Protected by the original A.O. Smith glass lining... backed by the industry's strongest five-year guarantee

Two, new storage-type water heaters have been added to Burkay's already complete line of storage and coil-type water heaters. The new heaters feature the famous A. O. Smith glass-lined tank, and for your added protection—a new five-year guarantee. These versatile models—B-197 (166 gph @ 100° TR) and B-250 (210 gph @ 100° TR)—can be installed in a variety of systems to meet many large-volume needs for one- or two-temperature hot water.

So *now*—more than ever—there's a Burkay water heater or water heating system to meet your individual requirements. Burkay heaters can be spotted at points of hot water use to eliminate costly heat loss from long piping runs. These new models are the result of the continuing research and development program of A. O. Smith—the world's largest producer of commercial water heaters. For more information, return the coupon below.

A.O. SMITH
CORPORATION
Burkay

MANUFACTURERS OF COMMERCIAL AND DOMESTIC WATER HEATERS, WATER CONDITIONERS AND HYDRONIC BOILERS

Kankakee, Ill., Newark, Cal., A. O. Smith International S. A., Milwaukee 1, Wis.

FREE BOOKLET

A. O. SMITH CORPORATION
Consumer Products Division
Dept. PE-1061, Kankakee, Illinois

Please send me information on Burkay gas-fired commercial water heaters for industrial plants. (CH-8000).

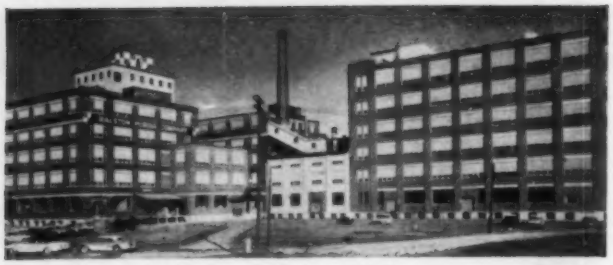
Name_____

Company_____

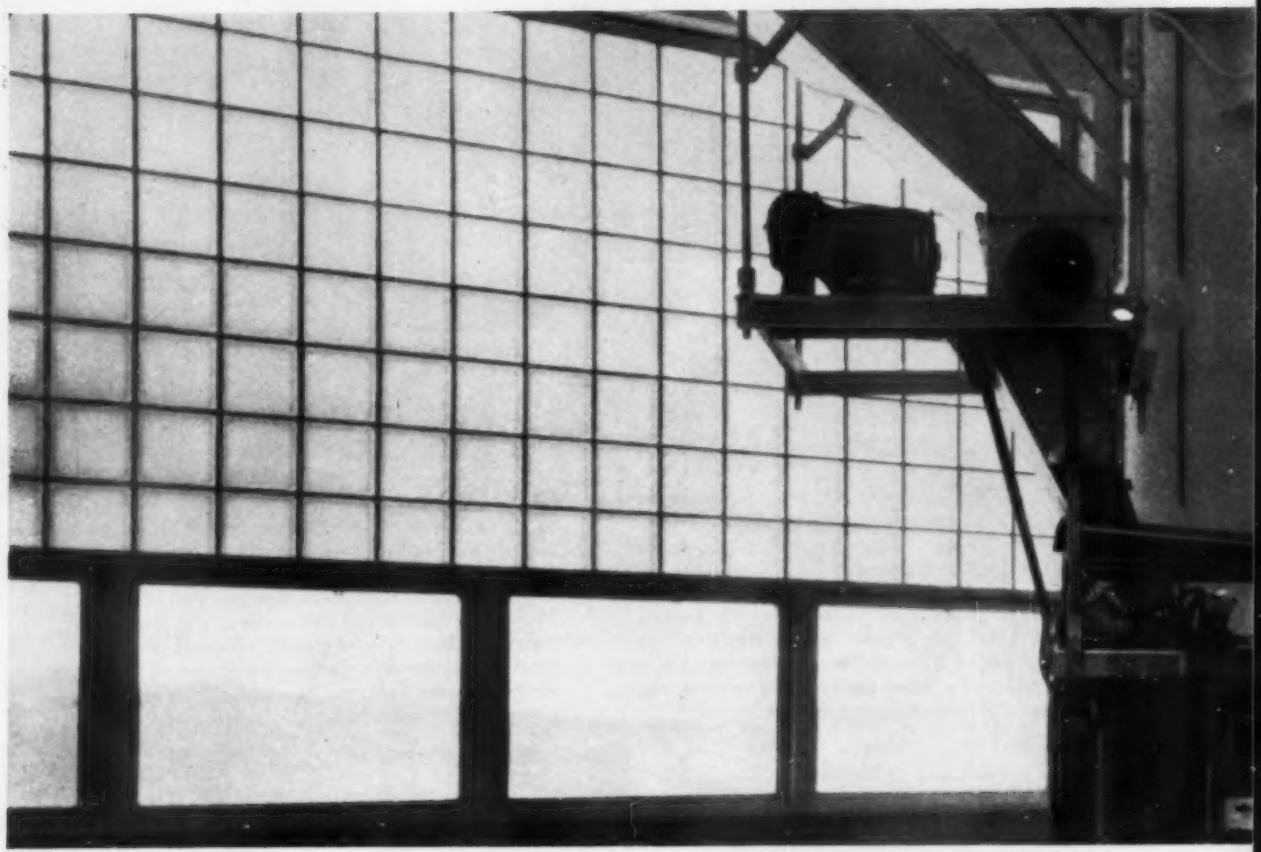
Address_____

City_____ Zone____ State_____

Circle 532 on postcard, page 33



Ralston Purina test proves PC Glass Blocks best for window replacement



Maintenance, corrosion and quality control problems prompted officials of the Ralston Purina Breakfast Food Company, Battle Creek, Mich., to conduct a series of tests to find the best sash replacement material. Plant Superintendent R. G. Lind and the Plant Engineer experimented with a variety of products as replacement for the deteriorating 40-year-old steel sash in three window bays.

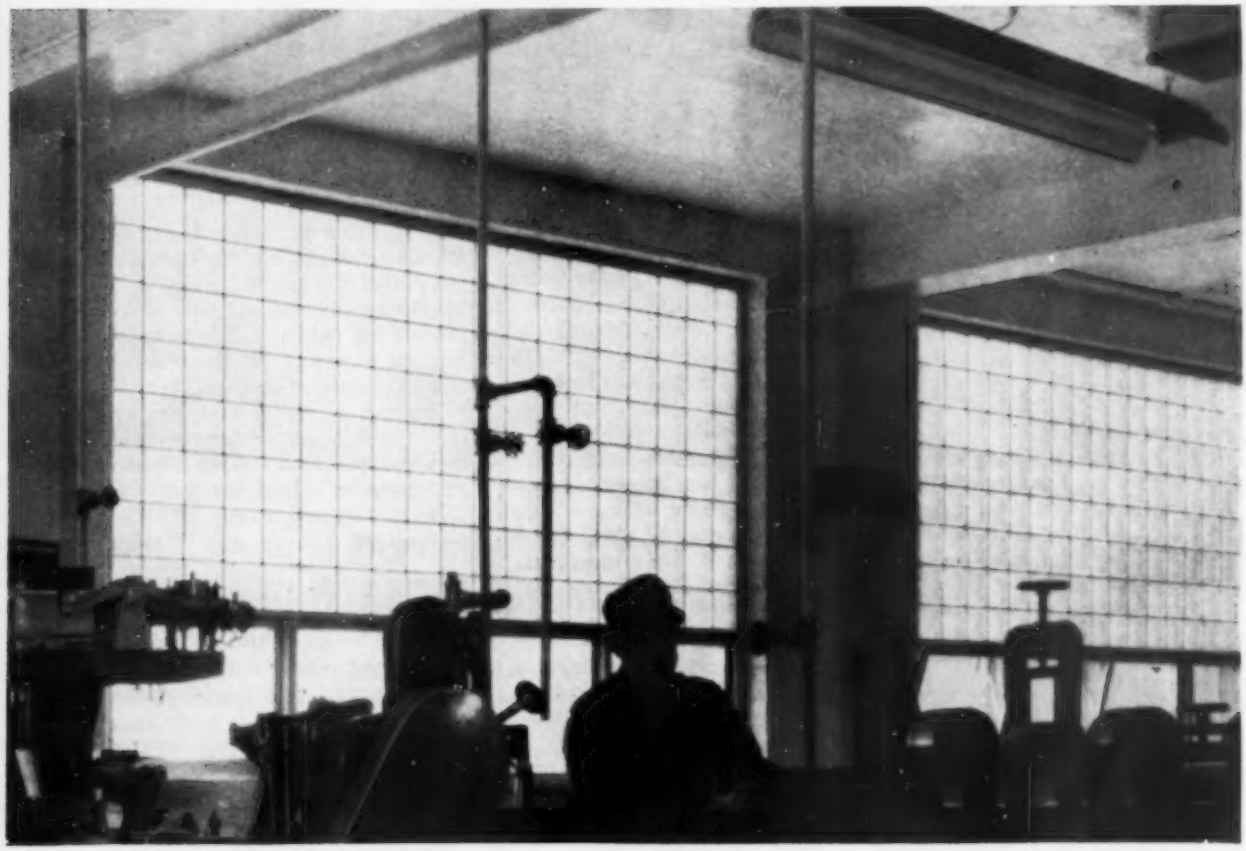
Tests proved PC Glass Blocks substantially cut window washing and maintenance, eliminated expensive calking and painting, added insulation value equal to a 12" concrete block wall, and improved sanitation and worker morale within the food processing areas. In the cooking areas, Glass Blocks eliminated corrosion and a streaked window effect which had been caused by the continuing condensation from the food processing.

PC Suntrol® Blocks were installed in 311 bays, totalling 32,344 square feet in four buildings. Suntrol contains a blue-green diffusing screen that cuts instantaneous heat gain and glare. Their sparkling appearance has greatly modernized the plant buildings, inside and out.

PC offers free renovation test kit:

To simplify your planning for problem sash replacement, Pittsburgh Corning is offering a free test kit (below) that gives testimonials on various plant applications, a specific case that shows a yearly savings of $3,031 in heating and maintenance costs, and an easy-to-calculate table of replacement cost. This "planned cost-reduction survey" will make it simple for you to estimate your plant's problems and eventual savings with PC Glass Blocks.

For your free kit simply mail the coupon below, or write to: Pittsburgh Corning Corporation, Dept. PE-101, One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, Que.



NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

TITLE_____

PITTSBURGH PC CORNING

Circle 533 on postcard, page 33

PLANT ENGINEERS' DIGEST—so those who rush may read and know what's new

Edited by Bea Berghorn

Alloy Kettle Resists Corrosion

MATERIAL suitable for a large vessel in which to polymerize modified-phenolic resins proved to be a challenging problem.

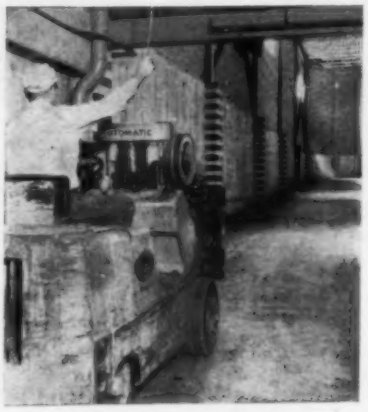
After careful study, Schenectady Varnish Co., Schenectady, N. Y., found Monel alloy to be the material best suited for the job.

This choice of alloy for the 1500-gal kettle was based on good heat transfer, which was necessary for curing the resins; the ease with which the kettle could be drained and cleaned; and one of the most important points, the corrosion-resistant properties. The alloy was found to be more corrosion-resistant than glass. *From Process Industries Quarterly, published by Huntington Alloy Products Div., International Nickel Co., Inc., Huntington, W. Va.*

Stop Lights Control Ramp Traffic

BECAUSE of a blind corner on a ramp, a system of traffic lights has been set up to prevent more than one truck from entering the ramp.

Several lift trucks are used to move paper rolls down the ramp to storage at Bleached Board Div. of West Virginia Pulp and Paper Co., Covington, Va.



As driver proceeds up a six-degree ramp, he pulls cord which changes light to red, thus warning others.

As the truck approaches the ramp, the driver checks a traffic light and proceeds if it is green. He then pulls a conveniently placed cord which changes the light to red at both the top and bottom of the ramp. As he leaves, he resets it for the next driver.

Because they make 600 trips per day, this arrangement has proven to be a real timesaver. *From a release of Automatic Transportation Co., Div. of Yale and Towne Mfg. Co., Chicago, Ill.*

Guide for Care and Maintenance of Hydrants and Hose

IN CASE of an industrial fire, hose and hydrants must be in perfect working order. To make sure that both are kept in tiptop condition at all times, check the following list, then clip and save this chart—the plant you save might be your own! *From The Sentinel, published by Factory Insurance Association, Hartford, Conn.*

Care of Hydrants

1. Test hydrants twice a year by full water discharge through all nozzles.
2. Check for possible leakage at nozzle caps, stuffing box, nozzles at barrel, and individual hose gate valves (if any) by fully opening hydrant with all nozzles closed.
3. Test ease of operation and tightness of underground gate valve (if any) controlling hydrant.
4. Check gasket; also condition and lubrication of threads of nozzle caps.
5. Make sure nozzle cap chains are free to turn on caps.
6. Check barrel drainage to make sure drain-outlet is not obstructed.
7. Check nozzle threads for possible damage.
8. Make sure wrenches and spanners are of proper size.
9. Test for proper clearance for wrench from hose house walls and from ground.
10. Check for vulnerability to mechanical damage and condition of existing guard posts or rails.

Care of Hose

1. Test hose hydrostatically once a year to at least the maximum pressure available from the connected water supplies.
2. Check condition of couplings and threads.
3. Check to make sure threads are the same as hydrants and other hose.
4. Check construction and ventilation of hose houses or cabinets to prevent mildew or water damage.
5. Examine storage arrangement to eliminate sharp bends and kinks.
6. Check for proper facilities for drying hose after use.
7. Check for obstruction to hose by hose house or protection rails or posts.
8. Check amount of hose and amount and condition of auxiliary equipment such as nozzles, lights, axes, spanners, etc.
9. Check for existence of acids, corrosive chemicals, rodents, etc., and if necessary provide hose with especially treated jackets.
10. Make sure hose is reserved for fire protection only.

Cut and mounted on cardboard, guide can be kept handy for ready reference.

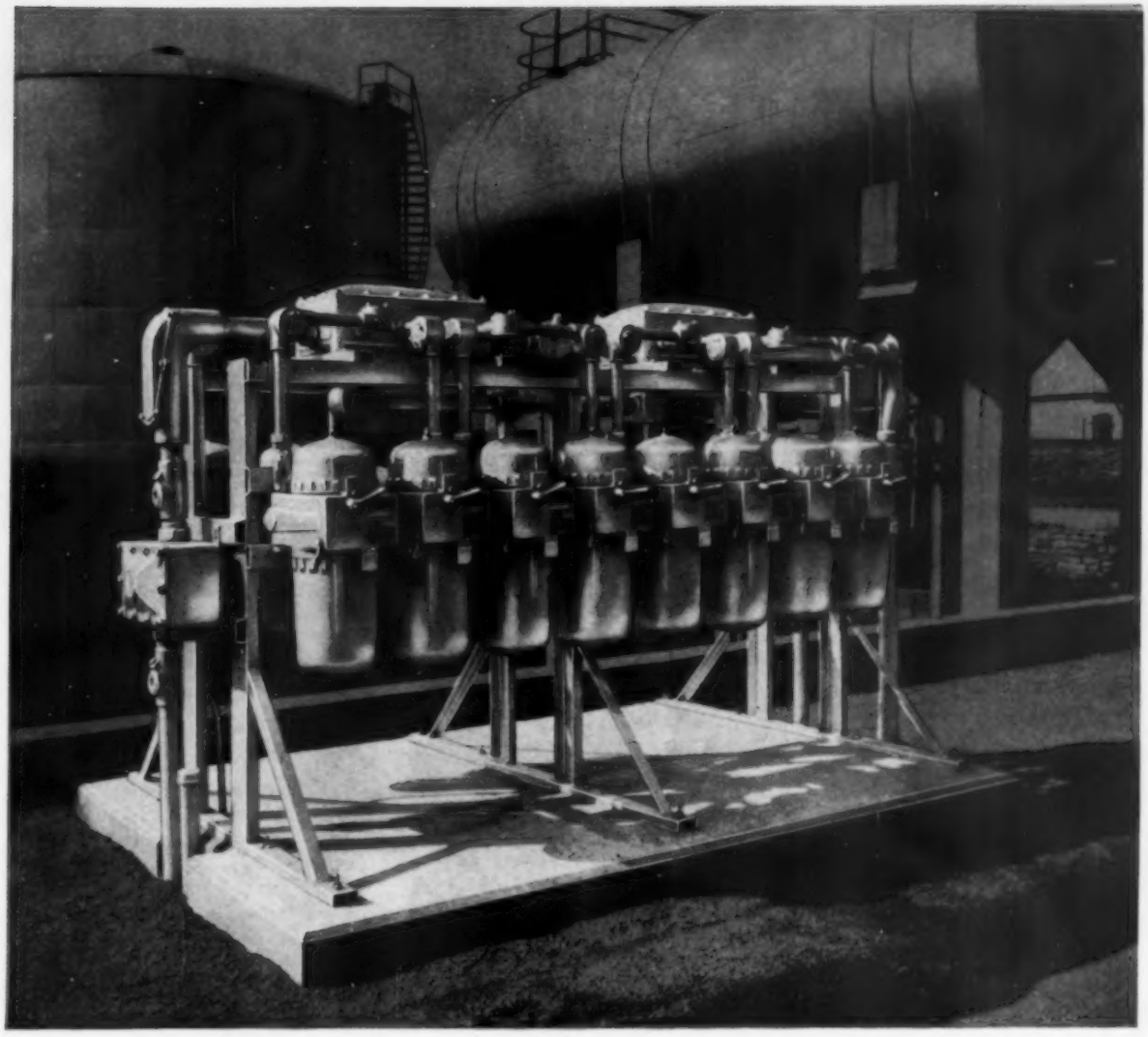
Refrigerated TV Cameras Tell Tale

OPERATIONAL control of slab reheat furnace is improved by two television cameras, refrigerated by special equipment.

The special equipment, designed and manufactured by the Lintern Corp., Painesville, Ohio, allows one operator, remotely located from furnace heat, to see inside the slab reheat furnace at U. S. Steel's McDonald Works, Youngstown, Ohio.

Placed three feet from radiant heat at 2300 F, the cameras are housed in compact, insulated boxes and protected by heavy-duty refrigerant coils which line the compartment walls and keep the cameras below 90 F.

One camera takes a continuous



Match the specs for your Motor Control Center with

CROUSE-HINDS Standardized Rack Modules

Crouse-Hinds rack modules for motor control centers may be assembled to accommodate any combination of Crouse-Hinds motor starters, circuit breakers and accessory equipment. They may be specified to conform to any of the following requirements under the National Electrical Code:

- **Class I, Divisions 1 and 2 (Type ERK)**
- **Class II, Divisions 1 and 2 (Type DRK)**
- **Weather Resistant, Raintight and Watertight (Type WRK)**

Crouse-Hinds long experience in the design and construction of control racks insures safe, correct compliance with your specifications, from the simplest to the most complex.

For complete quotations on motor control racks designed to meet your specific needs, check your Crouse-Hinds Distributor, or contact the nearest Crouse-Hinds Office listed below.

CROUSE HINDS

REG. U.S. PAT. OFF.

Syracuse, New York USA

OFFICES: Albany Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tampa Tulsa Washington
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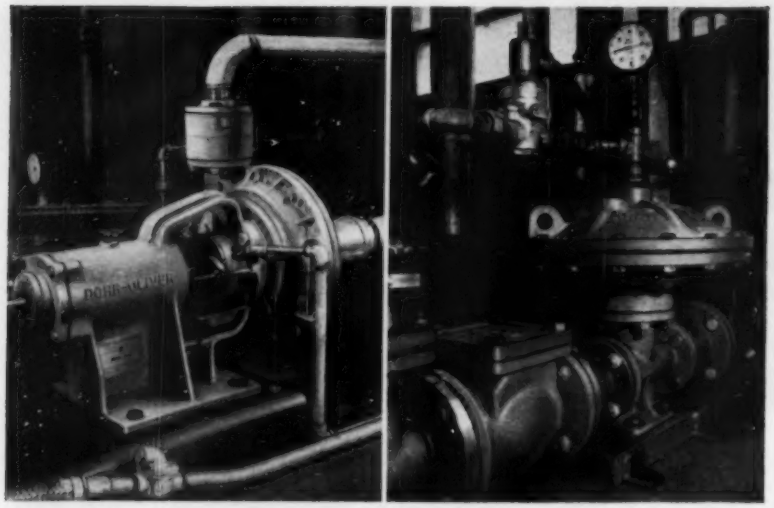
DORR-OLIVER SPECIALIZED PUMPS

solve widely different problems at Vanderbilt Chemical



Important end products at Vanderbilt Chemical Corporation, East Norwalk, Conn., are metallic based dimethyldithiocarbamates and diethyldithiocarbamates for use in natural rubber and butadiene styrene rubber products.

Processing operations involve problems requiring two entirely different types of pumps, each adapted for highly specialized service. Vanderbilt Chemical solves these problems with the two Dorr-Oliver pumps shown above. At left is the Olivite® lined centrifugal, designed for safe handling of highly corrosive and similar problem liquids. At right is the ODS® diaphragm type pump, designed for transfer of slurries with a high percentage of suspended abrasives.

Twelve Dorr-Oliver units are now in operation at Vanderbilt Chemical – all with the trouble free, low maintenance characteristics inherent in equipment of Dorr-Oliver design and manufacture. Dorr-Oliver is the only major manufacturer offering three distinctly different pumps designed for chemical process applications – the lined Olivite centrifugal, alloy centrifugal, and ODS diaphragm type.

For full information on the right unit for your special application, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

DORR-OLIVER

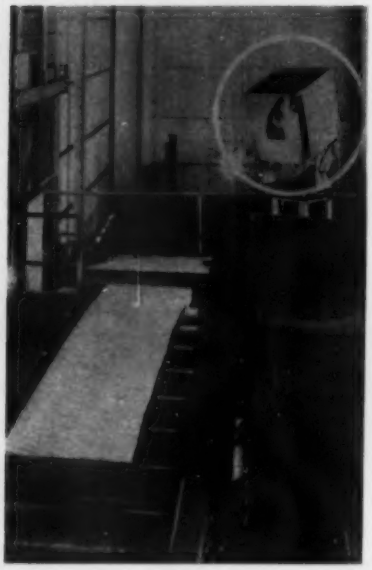
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

AT THE CHEM SHOW—Dorr-Oliver Booth 531

Circle 535 on postcard, page 33

PLANT ENGINEERS DIGEST

(Digest begins on page 56)



Refrigerated TV camera allows operator to observe charging of slab.

picture of the charging operation; the other, placed to see through a small opening, shows the slabs inside the furnace just prior to discharge. It is possible for the operator to view both screens simultaneously on two side-by-side television screens. *From a release of Lintern Corp., Painesville, Ohio.*

Ultrasonic Gage Shows Thickness

ULTRASONIC RESONANCE gaging has proven the answer to thickness measurements even when access to only one side of an object is possible. Thickness of tubing, large sections of sheet metal, hollow cylindrical parts, aircraft wings and fuselage sections can be determined quickly and accurately, at any location.

The Altamil Corp., Indianapolis, Ind., found that by using the Vidigage, made by Branson Instruments, they could make direct-reading thickness measurements to within accuracies of 0.1 per cent.

Using ultrasonic resonance to make the readings, a piezoelectric transducer converts electrical impulses into mechanical vibrations. When the transducer comes into contact with one surface of the metal under test, inaudible sound waves are sent into the metal. Returning waves in the metal are picked up by

PLAIN GROUT SHRINKS . . . leaves only a web of mortar and a small shim area to support the equipment baseplate. Result is a *short-life* grout that causes shutdowns . . . possible equipment damage . . . and expensive re-grouting.

EMBECO GROUT IS NON-SHRINK . . . readily and solidly fills the space to be grouted and permanently retains its original volume. Provides full, even baseplate support . . . helps assure proper equipment positioning and alignment. EMBECO means dependable, *long-life* grout.

Today's figures show that *machinery* for the average U. S. factory costs $4,680,000[1] — a sizeable, important investment geared toward smooth, efficient production. But the *grout* under this valuable equipment *costs only pennies* by comparison.

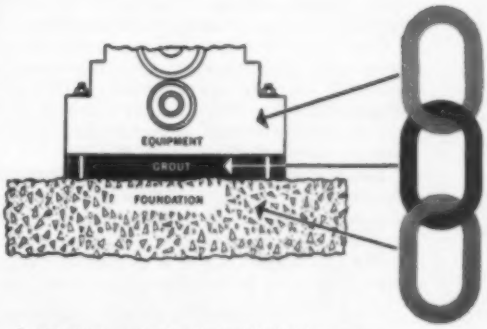
Compare the grouts pictured above. It's clear evidence that EMBECO can save *you* costly re-grouting and production downtime.

Here's why EMBECO means a superior grouting job every time—

- **Non-Shrink** . . . assures tight, level, permanent contact with equipment baseplate.
- **Flowable** . . . quickly, completely fills the space, increases ease of placeability.
- **Strong and Tough** . . . withstands impact, pounding action, vibration, side thrust and torque . . . maintains perfect alignment.

Before *you* grout another piece of heavy equipment—call in the local Master Builders field man for full information, or write to us for details on how EMBECO can help you *grout for good.*

[1]*U.S. average*—initial *machinery and equipment costs for new factories.*



★**GROUT** . . . is the "vital link" between equipment and foundation.

The Master Builders Company • Cleveland, Ohio
Division of American-Marietta Company
World-wide manufacturing and service facilities

Our 50th Year

MASTER BUILDERS®
EMBECO*

*EMBECO *is a registered trademark of The Master Builders Co. for its specially-prepared, flowable, non-shrink grouting products.*

Circle 536 on postcard, page 33

RELIABILITY

C&D unitized power pack increases switchgear reliability!

Utilities and industrial plants can greatly increase their reliability and protection for switchgear and control equipment by using C & D's *AutoCal** unitized Power-Pack.

Here's a dependable, high-capacity power package specifically built for tripping and control. It pairs a simple, compact, C & D *AutoReg*® silicon charger with powerful C & D PlastiCal® (lead-calcium grid) control batteries.

The charger is a completely automatic, constant voltage, current limiting type. It is automatically compensated to operate over an input range with a variation of ±10%, without the use of voltage or current sensitive relays. There are no special sensing circuits incorporating Zener diodes and transistorized elements. The charger has only two basic parts—a constant voltage, current limiting transformer and a silicon diode rectifier—thus assuring greater reliability.

PlastiCal batteries have extra-thick positive plates (0.266"). They provide a high one minute rate and only require 1/5 to 1/10 as much current to maintain a fully charged condition as do conventional batteries. Consequently, there is so little electrolysis of water that PlastiCals need be watered only once a year.

The combination of a C & D *AutoReg* charger and PlastiCal battery gives you self-protected charging, instantaneous peak power, and long trouble-free life.

Get the full details—write for Bulletin AR-102 today!

MOUNTINGS

Cubicle Mounting.

Relay Rack Mounting for standard 19" relay rack.

Weather-Proof Outdoor Mounting. Both charger and batteries fit in a weather-proof cabinet.

Wall Mounting.

C & D BATTERIES
of Conshohocken, Pa.
DIV THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell® and PlastiCal® Batteries for Communications, Control, and Auxiliary Power • Producers of AutoReg® Silicon Chargers and AutoCal® Charger-Battery Combinations

*Trademark, C & D Batteries Div. The Electric Autolite Co.

Circle 537 on postcard, page 33

PLANT ENGINEERS DIGEST

(Digest begins on page 56)

the transducer, and fed back into the electronic circuit.

A calibrated scale is placed right in front of the tube, permitting direct reading of thickness, which is inversely proportional to the resonant frequencies. Connected to automatic control equipment, the instrument makes production faster and more exact. *From a release of Branson Instruments, Inc., Stamford, Conn.*

Second Story Worker

Required for the installation of a 1500-ton paper machine on the second floor of the Garden State Paper Co.'s new building at Garfield, N. J., this truck crane was hoisted by a larger crane through the wall opening intentionally left for this purpose. Mission accomplished, the truck crane was removed by the same method and the building wall completed. (From a release of Coyle and MacDonald Company, Inc., Passaic, New Jersey.)

Laundry for Lighting Fixtures

CLEANING lighting fixture louvers by use of a portable washing machine saves both time and money.

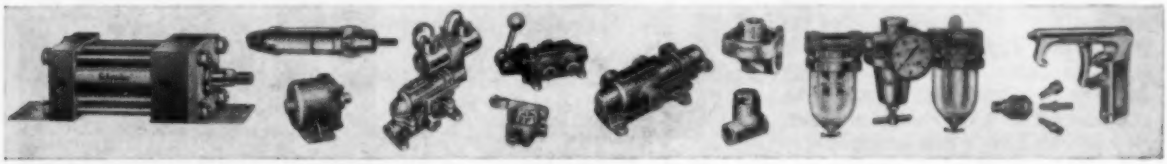
At the Ohio Savings Assn., Cleveland, Ohio, 130 louvers were removed, cleaned and reinstalled in 24 man-hours, compared to 30 to 36 man-hours using conventional cleaning methods.

The new machine is a self-contained unit which automatically ap-

EXAMPLE: Schrader Square-end Cylinders not only have quality built into every part, but feature many extras. For instance, the unique cartridge-type bronze bearing assembly (A) is easily removed by releasing just one retaining ring—no need to dismantle the entire cylinder for bearing maintenance. Special "step" design cylinder seal (B) assures perfect alignment and positive seal without danger of gasket damage. Below surface cushion adjusting screws (C) are protected from damage but fully accessible. They lock to eliminate loosening due to vibration.

Interchangeable with all JIC cylinders, Schrader also provides a variety of mountings. Special bushings are available for bone-dry piston rod in hydraulic operation.

ANOTHER EXAMPLE: Schrader's new direct action Hydraulic Gauges without mechanical linkage (A) eliminate fatigue failure of internal parts. They can withstand 100% overload without damage to accuracy, and are triple-damped (B) to eliminate indicator oscillation from pump pulses, surges, or shock that would damage other types. Can be maintained and calibrated easily in the field. PSI pressure ranges 0-500, -1500, -3000, and -5000.



This new Schrader catalog is available at your Schrader distributor, who is stocked with the complete range of sizes and types of Schrader air circuitry products. Consult the Yellow Pages or write Schrader.

FULL LINES OF QUALITY AIR CIRCUIT COMPONENTS • OFF-THE-SHELF SERVICE AND INFORMATION FROM YOUR NEARBY DISTRIBUTOR • STAFFED WITH AIR CIRCUIT EXPERTS • CONSULT YELLOW PAGES OR WRITE FOR HIS ADDRESS

Schrader®
a division of SCOVILL

A. SCHRADER'S SON
Division of Scovill Manufacturing Co., Inc.
484 Vanderbilt Ave., Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

Circle 538 on postcard, page 33

WITH STEAM TRAPS TOO—

TYPE "G"
Cast bronze bodies. 0-150 PSIG.
½" & ¾"

TYPE "L"
Cast steel bodies. 0-300 PSIG.
½" & ¾"

TYPE "P"
Semi-steel bodies.
0-250 PSIG.
½" through 2"
Also available as
Type "R" in cast steel.

TYPE "S"
Cast bronze bodies.
0-250 PSIG.
½" through 1"

YOU DESIGNED THE B&J STEAM TRAP

Because you wanted the many advantages of thermostatic traps — high air and water capacities, simplicity, single orifice size over full pressure range, the ability of repairing and maintaining right on the line with a minimum of shutdown time and labor cost, plus dependable uniformity of operation obtained by calibration. Calibration permits use of a **one-piece interior** that makes the dream of simplified maintenance come true.

WHAT IS INSIDE THE B&J STEAM TRAP

A one-piece operating mechanism. A "Trap Within A Trap." All working parts of the B&J trap, bellows, plug **and seat** are locked in calibration inside a stainless steel cage which is completely independent of all tolerances in trap body and cover. **Not** a collection of parts to install, but a **single** piece to drop in while the trap is on the line.

CAGE UNIT
One-piece trap interior. Monel Bellows, Stainless Steel Plug & Seat. Calibrated for sensitivity.

BARNES & JONES, INC.
34 Crafts St. • Newtonville 60, Massachusetts

Circle 539 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 56)

Soiled fixture inserted into machine on one side, is taken from other side, clean and ready for immediate use.

plies wetting agent, detergent, brushing, rinse spray and destaticizer to ceiling panels and diffusers.

Soiled fixtures are inserted into the machine from one side and are removed, clean and ready for stacking, from the other side. *From a release of Wash-A-Matic Co., San Francisco, Calif.*

Production Doubled, Labor Halved

USING three drill presses for routing slots in counter tops has doubled production while halving labor.

Store Kraft Mfg. Co., Beatrice, Nebraska uses a special setup—three tools ganged together, with the

One man, using three drill presses, doubles production of counter tops.

Depth of line...depth of service!

You get the full benefit of the full line every time you choose Black & Decker . . . over 130 power tools, *thousands* of B&D Accessories for everything from drilling to grinding, cutting to cleaning. They're all powered to make better time, cut costs quicker . . . built to stay on the job longer, handle the job easier.

Your Black & Decker distributor has them all. And he offers you complete service, too. Dealing with your distributor cuts your costs by holding down paper work, saving transportation costs, keeping down inventories . . . gives you fast catalog and price information, immediate service on adjustments and complaints . . . centralizes your buying and gives you superior credit facilities. Black & Decker Tools are sold by leading distributors everywhere. *For sales or service, look in the Yellow Pages of your telephone book under* TOOLS ELECTRIC

Black & Decker

CUTS MAN-HOURS TO MINUTES

Circle 540 on postcard, page 33

THE BLACK & DECKER MFG. CO., Dept. 0810
Towson 4, Md. (In Canada: Brockville, Ont.)

☐ Please arrange for a demonstration of.....

☐ Please send me more information on.....

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Company.....

Address.....

City..... Zone.... State.....

☐ Drills ☐ Hammers ☐ Vacuum Cleaners ☐ Belt Sanders

EXCLUSIVE NEW FEATURES put the "85" in a class by itself for saving you money in sweeping.

TENNANT "85" SWEEPER *pays for itself fast...*

sweeps a full mile of aisles in less than 30 minutes!

Gliding swiftly over your floors, this all-new, superbly engineered TENNANT "85" Sweeper *sets a new standard in cost-saving cleanliness* . . . plus heavy-duty dependability for *any* job.

In 30 minutes, for example, it easily sweeps a full mile of 8 ft. aisle . . . or over 100,000 sq. ft. per hour in open areas. Leaves an ultra-clean 53" path.

Saves up to 60% in hand-sweeping costs, doing the work of 3 to 12 men. New hydraulic drive, floating brush and simple controls make it easy to use. Your operator does a top notch job the first time.

New features assure exceptionally clean sweeping *at all speeds*—plus additional capacity for difficult jobs. Has constant-speed brushes and vacuum . . . one of the largest filters on any industrial sweeper . . . powerful 18 hp engine . . . 16" wheels for better traction on ramps.

100% mechanized operation saves time. Single pedal for forward-reverse; just touch button to clean dust filters; twist of knob dumps 800 lb. load. *Usually pays for itself in less than a year.*

HEAVY-DUTY "85" has ample power for grueling use on ramps and inclines and over bumpy pavements. Path swept (53") is ideal width for sweeping most factory aisles in one round trip.

NEW BULLETIN gives full details on how the "85" slashes sweeping costs. Shows photos, performance data, specifications and cost-saving applications. Write today to G. H. Tennant Co., 771L N. Lilac Drive, Minneapolis 22, Minn.

TENNANT

HEAVY-DUTY
POWER SWEEPERS

INDUSTRY'S MOST COMPLETE
FLOOR MAINTENANCE SYSTEMS

Circle 541 on postcard, page 33

PLANT ENGINEERS DIGEST

(Digest begins on page 56)

drill press belts set at highest speed for routing. The counter top is set in an angle iron frame and moved into the routing bits turned by the drill presses.

The two end drill presses are movable so slots may be made anywhere in the counter tops. Now one man can operate the three presses, where formerly it took two men to operate a portable router. *From a release of Rockwell Mfg. Co., Pittsburgh, Pa.*

Asbestos Packing Boosts Output

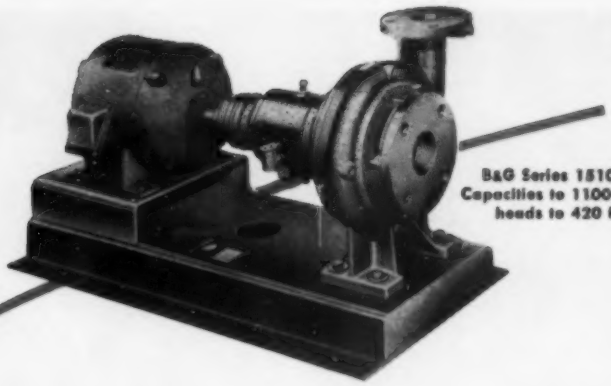
PROBLEMS of excessive downtime and severe leakage which created objectionable working conditions with a paint spray machine were solved by using braided asbestos packing.

The paint spray machine, used to coat acoustical ceiling tile with a water soluble coating, was originally packed with a material that hardened quickly in operation and could only be taken up once.

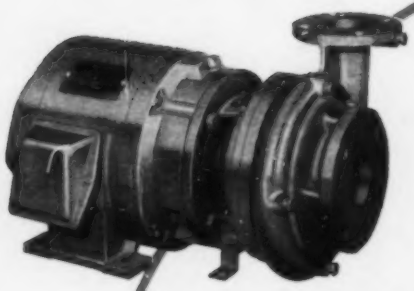
Wood Conversion Company, Cloquet, Minn., found that by using a packing of asbestos yarn, square-plaited braid, which had been thoroughly impregnated with a transient lubricant and soft enough to be taken up several times, they increased packing life from five to seven days to better than four weeks and raised operating efficiency 15 per cent. *From a release by Raybestos-Manhattan, Inc., Packing Div., Passaic, N. J.*

By installing low-friction, surface-treated packing to spray machine, downtime was cut, production raised.

A GREAT LINE OF PUMPS ALL EQUIPPED WITH THE...

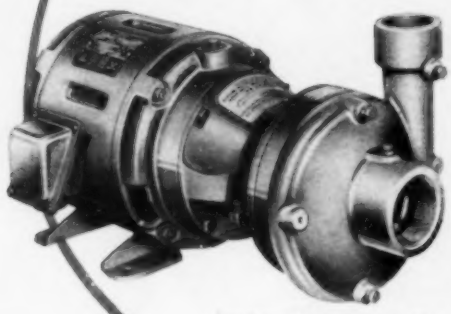


B&G Series 1510-B. Capacities to 1100 GPM, heads to 420 ft.

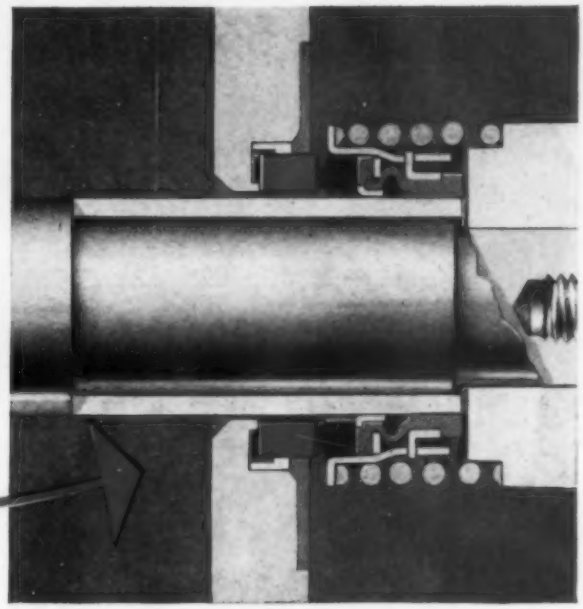


B&G Series 1531-B. Capacities to 1500 GPM, heads to 420 ft.

B&G "Remite"®
MECHANICAL SEAL
...an exclusive feature for leakproof operation



B&G Series 1522. Capacities to 150 GPM, heads to 115 ft.



Take just a moment to examine the design features of B&G Centrifugal Pumps. You'll find plenty of reasons why these pumps are giving trouble-proof performance through long years of service.

Vertical split-case construction permits removal of the bearing bracket without disconnecting pipe lines or motor leads. Solid cast iron volutes, with support feet in larger units, effectively prevent piping strain on the motor.

The shafts of B&G Centrifugal Pumps are an outstanding feature. Made of special alloy steel, they are super-finished and oversized to keep deflection at a minimum. The "Remite" Mechanical Seal—a B&G development—positively prevents leakage...and impellers are soundly designed to maintain hydraulic balance. An oil lubrication system, instead of grease cups, assures continuous protection to the long bronze bearings.

Exclusive "Remite" Mechanical Seal

This B&G feature eliminates the customary leakage which occurs where a packing gland is used. A Carbon Seal Ring faces on a "Remite" floating seat—*a new type of material, so hard it will scratch glass—wear-proof and corrosion-resistant.* Metal parts are of steel, bronze or stainless steel, depending upon the type of service. The B&G Mechanical Seal is self-lubricating.

Materials of construction

B&G Centrifugal Pumps are available as all-iron, bronze-fitted and all-bronze units. *Series 1522 Pumps are also available in stainless steel.*

IMMEDIATE DELIVERY
ON PUMPS IN FACTORY STOCK
Available in commonly used sizes—capacities to 500 GPM, heads to 180 ft. Send for catalog CSP-360.

BELL & GOSSETT
COMPANY
Dept. GV-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ont.

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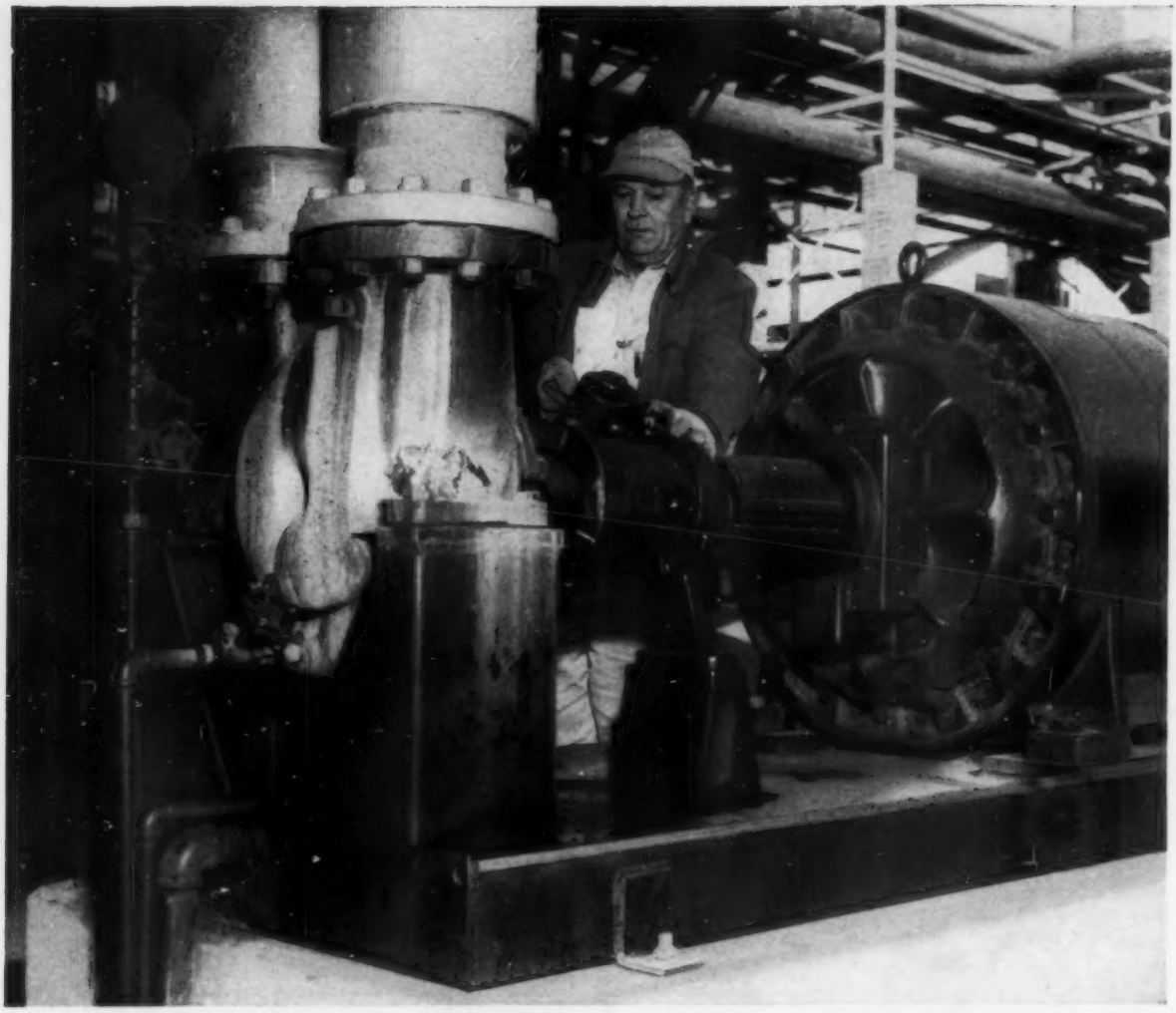


2½% nickel cast iron impeller in this pump has handled salty crude oil twenty years at Continental Oil's Ponca City, (Oklahoma), installation. Salt concentration varies from 1-10 lbs. per 1000 bbls. handled, at temperatures from 200°-240°F.

2½% Nickel Cast Iron impeller handles briny oil 20 years—without downtime for repairs

Demonstrates Nickel Cast Iron's superior resistance to wear and corrosion in fluid handling equipment

The impressive record of this impeller is an example of 2½% nickel cast iron's superior resistance to wear and corrosion. It shows how nickel cast iron, at a modest initial cost, can provide longer life and lower maintenance costs in fluid handling equipment.

Combination of advantages in nickel cast iron fluid handling equipment

There's a whole family of 1 to 3% nickel cast irons—each offering a *combination* of properties beneficial for fluid handling equipment. These properties include higher tensile strength and improved resistance to wear, galling and heat (up to 650°F.). Other benefits of nickel cast iron are increased hardness with good machinability, greater toughness, greater torsional strength, and improved resistance to graphitic corrosion.

Can nickel cast iron help you improve efficiency and cut costs?

Find out how the various *combinations* of useful properties available in nickel cast iron can prolong life and reduce maintenance costs of *your* fluid handling equipment. Write for our helpful, comprehensive 28-page booklet, "Engineering Properties and Applications of Nickel Cast Iron."

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

Circle 543 on postcard, page 33

The Enro Shirt Company, Inc., Louisville, Ky.—ENGINEERS: Fink & Zwecker, Atlanta, Ga.

Alcoa Alumalure finish: fountain of youth for factories!

Baked onto treated aluminum sheet, Alcoa® Alumalure® finish defies sun, rain, corrosive smoke and salt air. It lasts years with little or no maintenance. Should the coating be damaged, aluminum underneath still can't rust. Another beauty of Alumalure finish: It costs just pennies extra a foot.

Twelve durable Alumalure colors come on Alcoa Aluminum V-Beam, Ribbed or Corrugated Roofing and Siding. Order from your nearest Alcoa jobber, or your Alcoa sales office. For data, design details or a color-swatch brochure, write: Aluminum Company of America, 819-K Alcoa Building, Pittsburgh 19, Pa.

Entertainment at its Best... **ALCOA PREMIERE** with Fred Astaire as Host... Tuesday Evenings, **ABC-TV**

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Circle 544 on postcard, page 33

Circle 545 on postcard, page 33

Distributor-to-factory direct order service speeds shipment of General Electric QHT dry-type transformers.

You can get 24-hour shipment on most General Electric QHT dry-type transformers

Forget about changing your schedule because you can't get on-time delivery of dry-type transformers. You can get most General Electric QHT dry-types as fast as you need them. Chances are the QHT transformer you want is one of the popular ratings your nearby General Electric distributor keeps in stock. If so, you can get immediate delivery. Otherwise, your G-E distributor can, within minutes, place your order on the General Electric factory, where stocks of 900 models are kept. A direct order arrangement with the factory enables him to do this. Within hours your QHT transformer will be on the way to you by whatever means are necessary to meet your schedule.

QHT transformers also save production space because they offer savings up to 50 percent in weight and 67 percent in size compared with competitive dry-types. You can easily mount QHT units in out-of-the-way places near the load and save the cost of long, low-voltage feeders.

QHT dry-type transformers are quiet, making them ideal for schools, hospitals, office buildings, and other places where noise could be a problem. Each rating of QHT transformers has a sound level equal to or less than NEMA standards. QHT sound levels are at least 15 decibels less than older designs.

Installation is fast and easy. You wire General Electric QHT transformers from the front. Conveniently placed dual-sized knock-outs, large terminal compartments, solderless connectors, and numbered terminals save time.

For more information, call your nearby General Electric distributor. Or write for GEA-6907A "QHT Specifier's and Buyer's Guide" to Section 411–18, General Electric Co., Schenectady 5, N. Y.

® Registered trademark of General Electric Co. for quiet, high-temperature dry-type transformers.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Putting an ill-fitting set of harness on a team was all it took to cause an old time horseman to commit mayhem.

Maiming of persons can also result from haphazard harnessing of hoisting equipment horsepower to load.

The patented 9-part machine-braided wire fabric construction of Union Tuffy Slings gives you strength you can trust on any load for which the various sizes and types are rated. It also gives you hard-to-kink and easy to unkink flexibility to enable your men to sling loads faster, easier and with greater safety.

Put Union Tuffy Hoist Line On Your Team

Hook Union Tuffy Slings onto Union Tuffy Hoist Lines and your hoisting equipment is harnessed to handle more loads faster and for longer service.

Union Tuffy Hoist Line is a special wire rope construction with the right combination of strength, flexibility and toughness for greater safety and service life in its specific range of uses on overhead cranes, derricks, stiff leg and mobile cranes.

Union Wire Rope Tuffy Tips on safe use of Slings and Hoists

Safety in Hoisting Saves Costly Injuries

During a recent 12-month period, lost-time back injuries reported in one state (California) totaled 32,643. Lost-time injuries caused by strain or over-exertion: 24,639.

A high price to pay—in misery and money—for lifting, pushing or carrying loads. Medical aid and compensation costs of materials handling accidents run far into the millions every year. Proper hoisting equipment, properly used and maintained, is one important answer to this problem.

Free! Two Valuable Tuffy Handbooks

1. "Tuffy Tips." Gives many other safety hints. Also tells how proper fittings and correct use of slings and wire rope can lengthen service life. Chock-full of do's and don't's to save money, time and work.

2. "Tuffy Sling Handbook." Tells all about slings from A to Z. Contains helpful data on the selection and use of slings—types, dimensions, weights, fittings, rated loads, safety-approved signals.

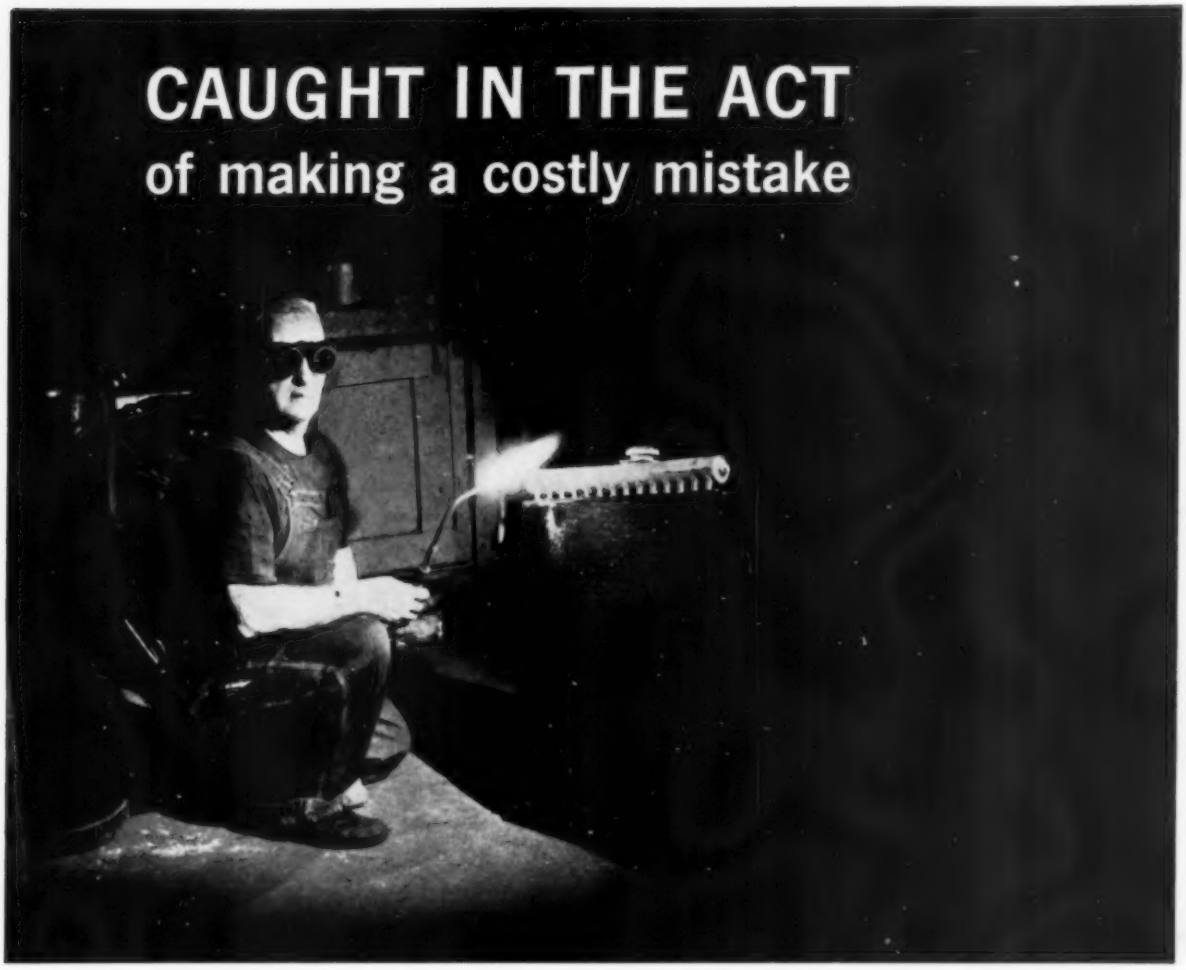
5-61

Write Union Wire Rope, Armco Steel Corporation, 2272 Manchester Avenue, Kansas City 26, Missouri

ARMCO Union Wire Rope

Circle 546 on postcard, page 33

CAUGHT IN THE ACT
of making a costly mistake



don't waste money repairing old unit heaters
replace with new Modines!

MODINE STEAM AND HOT WATER UNIT HEATERS — Horizontal, vertical and Power-Throw® types . . . in a wide range of sizes.

MODINE GAS-FIRED UNIT HEATERS — Propeller units (shown) are attractive, lightweight. Eight sizes—25,000 to 310,000 Btu. Gas-fired blower units are available in seven models from 50,000 to 310,000 Btu.

We caught this man with his heater down! He should have taken this tip from Modine: when a 10- to 15-year old unit heater starts to leak, it's almost a sure sign useful life is over. One leak usually leads to another, making repairs a gamble.

Don't throw good money after bad. Instead, replace your old units with new Modines. On the Modine-Plan for replacement, you eliminate the danger of production interruptions due to unexpected heating failures. You avoid the expense of frequent, ineffective repairs. And you get the *finest;* new Modines heat better, use less fuel, run quieter, require only routine maintenance.

For full details on the Modine-Plan for replacement, contact your qualified heating contractor or your nearest Modine representative. Or write Modine Manufacturing Co., 1563 DeKoven Ave., Racine, Wis. SU-1444

Modine®
MANUFACTURING COMPANY

In Canada: Sarco Canada, Ltd., Toronto, Ont.

Circle 547 on postcard, page 33

Circle 548 on postcard, page 33►

WALWORTH

TAKES THE WRAPS
OFF ANOTHER
FIRST IN VALVE
ENGINEERING

NEW BUBBLE-TIGHT BRONZE GLOBE VALVE

with

DUAL SEALING

ABSOLUTELY BUBBLE-TIGHT!

Here's the newest concept in valve design. Resilient unplasticized resin insert gives absolute shut-off in critical piping—at low torque. Now available for your particular requirements, the new Walworth Bubble-Tight Bronze Globe Valve is already in service aboard nuclear submarines, and in cryogenic gas piping systems—and is particularly suitable for the most critical water, oil and gas piping systems.

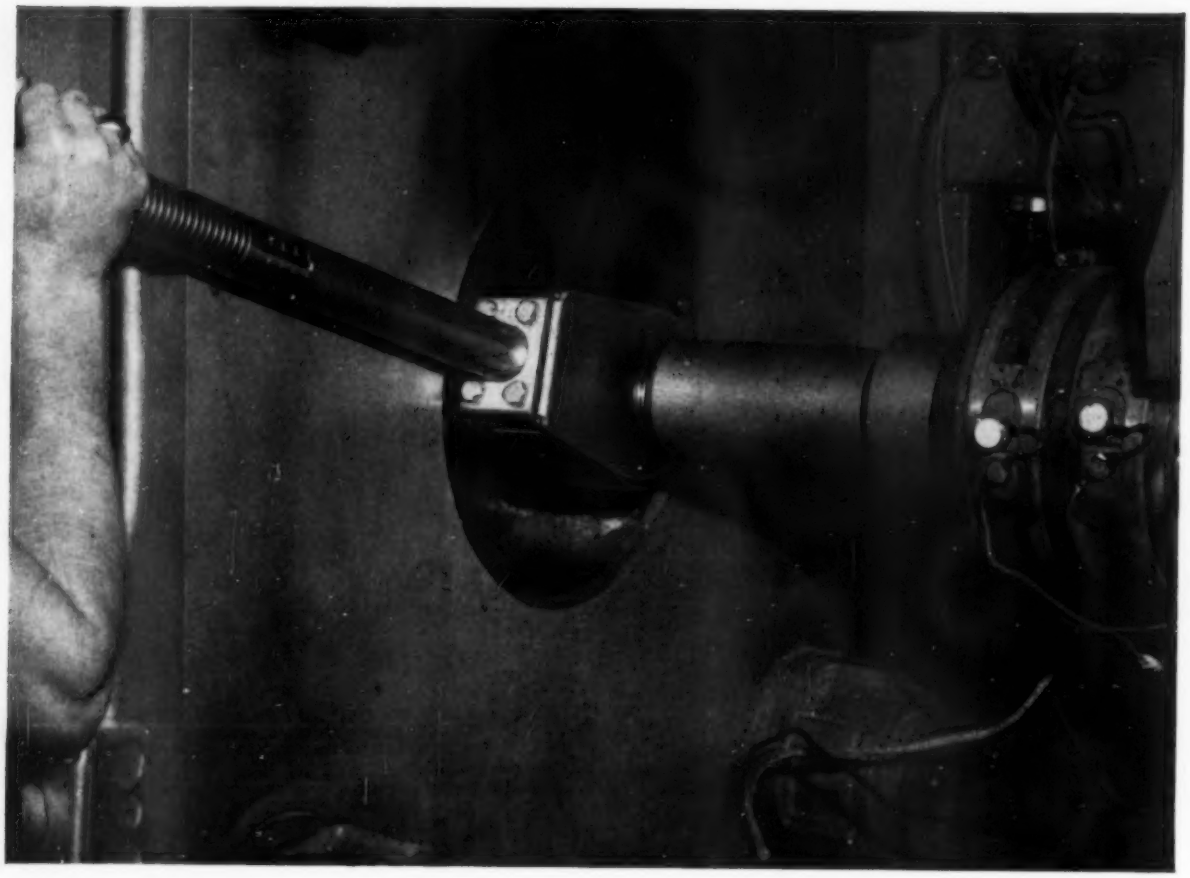
DUAL SEALING This unique unplasticized resin insert provides full 360° seal against matching monel seat. Secondary metal-to-metal seating further assures tightness... consistently. Write for descriptive bulletin.

WALWORTH

750 THIRD AVENUE, NEW YORK 17, NEW YORK

The Walworth Companies: Alloy Steel Products Company ■ Conoflow Corporation ■ Grove Valve and Regulator Company ■ M&H Valve and Fittings Company ■ Southwest Fabricating & Welding Co., Inc.

the SWENCH® is a wrench like no other — and will work where no other can. It's the world's first manual impact wrench. Loosens frozen nuts and bolts in seconds . . . tightens with precise accuracy every time. SWENCH is completely portable . . . needs no outside power — yet multiplies torque many times. It safely handles more bolt sizes than any comparable power wrench, but costs less. Read how you'll save with the SWENCH:



SWENCH® cuts 36-hour down-time to 30 minutes...saves $4,000

In plastic plants, the job is a common one: removing the hex nuts that hold the injection nozzles in place.

Trouble is, the nuts have a way of freezing tight. One plant figured on 36 hours down time to sledge them loose. Power impact wrenches couldn't be used: not enough room.

Then — SWENCH, the hand-operated impact wrench, came to the rescue. Seven impacts, and the first nut came free. Thirty minutes, and the entire job was done — at a saving of $4,000!

The amazing SWENCH works anywhere, carries its power built-in. Exerts many times the energy needed to pull the handle, smoothly and evenly: gives you more power with greater safety.

Six models cover bolt sizes from ½" to 2½". For the full story on SWENCH, how it works, what it costs, how it saves, see your local distributor, or write:

AD NO 32-35

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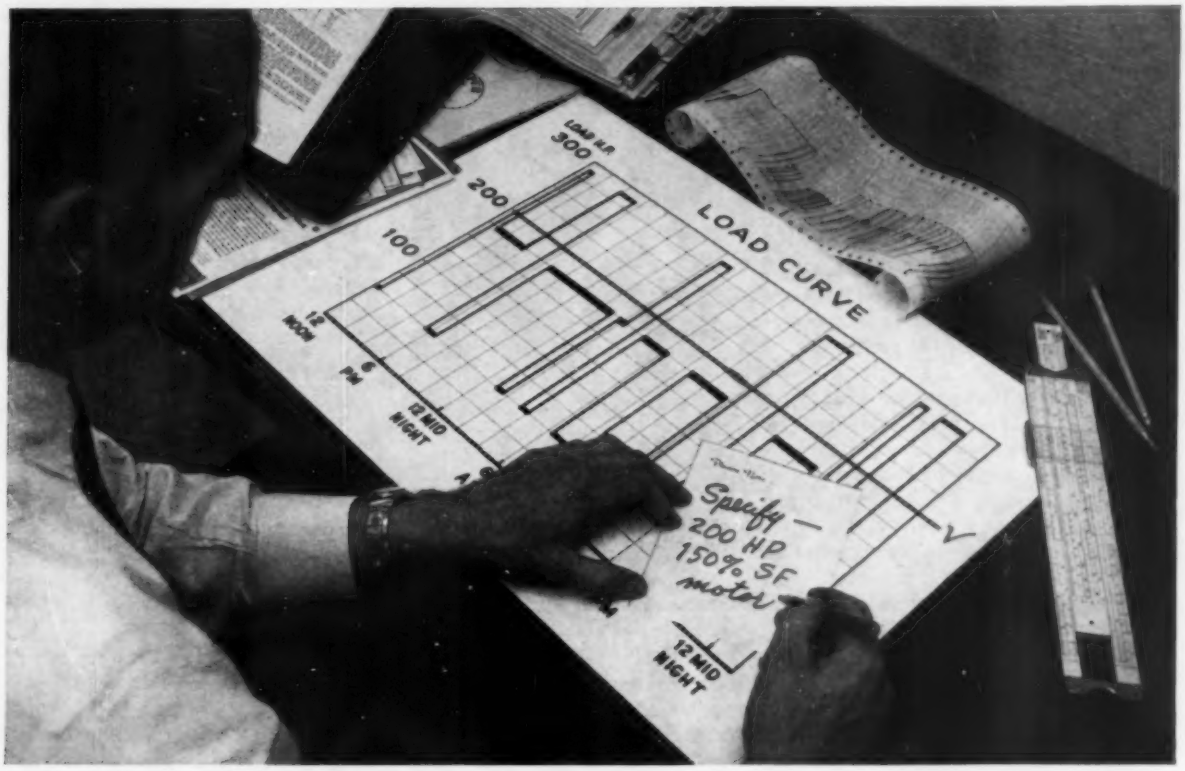
SILICONE NEWS from Dow Corning

Over-motoring Out-moded



Specify horsepower for nominal loads, Service Factor to handle the peaks!

Specifying motors with nameplate horsepower rated for peak load conditions is rapidly being out-moded as too expensive.

Today, it's far more economical . . . and just as reliable . . . to specify silicone insulated extra service factor motors with horsepower ratings based on nominal load conditions.

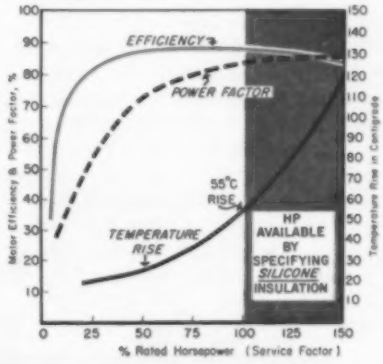
Additional horsepower output — up to 50% above nameplate rating — is available for peak loads.

Where does this additional capability come from? It's the hidden horsepower in the higher service factor rating! It's the result of the exceptional thermal stability of silicone insulating materials.

Life and reliability of these motors is unaffected by peak loads . . . silicones are immune to the heat of even constant loads within the service factor rating. So why specify a 300-hp motor when a 200-hp motor with a 150% service factor is what's needed? Silicone insulated extra service factor motors give you these extras, too:

Top efficiency is obtained under normal load since the motor is operating at its designed horsepower rating most of the time.

Additional savings in several ways: additional nameplate horsepower is usually more expensive than the extra service factor silicone insulation provides; additional horsepower requires extra floor space and heavier mountings; over-motoring power factor problems are eliminated or minimized.



Free brochure — "Specify Silicone Insulated Equipment and Save."

Write Dept. 0822

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Dow Corning CORPORATION

MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Circle 550 on postcard, page 33

OPERATION AND PRODUCTION—pointers for the industrial plant engineer

Edited by Ken Lawson

Savings Via Short Arc Welding

SHORT ARC WELDING, a process developed especially for joining thin-gage metals, employs a low-voltage arc which "shorts out" dozens of times per second. Smooth electrode melt-off results at the weld puddle, with no weld splatter. Shorting the arc lets the puddle cool, which minimizes heat distortion, controls burn-through for ideal penetration and permits consistent quality in production welding.

To improve the quality of their aluminum storm doors, Moloney Company, Albia, Iowa, have switched from manual welding of door corners to Linde Company's sigma short arc automatic welding machines.

Twin short arc torches automatically weld both sides of storm door corner.

To reduce the sag tendency, extra metal is automatically deposited at the inside corner of the joint by a predetermined surge of welding power. Machine operation is completely automatic. Special clamps position the parts, to divide any variation in thickness equally between the front and back surfaces of the door. The automatic machine cycle starts by positioning the work, then moves it upwards as twin stationary mig torches make the welds at 16 ipm using 12½ v, 55 amp, d-c reverse polarity.

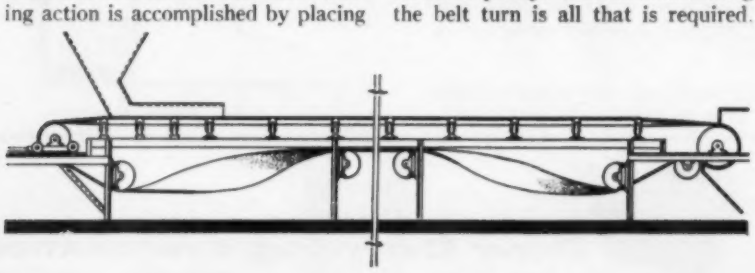
The initial surge of current produces full penetration and extra weld reinforcement at the inside corner of the joint. Because lengths of the front and back welds differ on certain doors, the machine is designed to sense joint length and automatically set each torch for the correct weld time. Both torches oscillate 140 times per minute to produce a smooth, wide bead. After welding, door surfaces are automatically milled to a decorative finish on the same fixture.

Turnover Belt Conveyor System Stops Buildup on Idler Pulleys

RECENTLY patented by B. F. Goodrich Industrial Products Company, a turnover belt conveyor system allows belts to twist themselves automatically, reversing top and bottom surfaces after delivering and before accepting a new load. Object of the turnover action is to position the clean side of the belt on top of the return idlers.

This prevents buildup of tacky materials on idlers or pulleys. These accumulations can damage idler equipment and shorten belt life. The twisting action is accomplished by placing two twist pulleys at each end of the belt flight. Each set of twist pulleys turns the belt 180 degrees. The belt's thick carrying cover is always positioned to receive the load and the return idlers contact only the clean side of the belt.

Recommended for use wherever a conveyor belt handles moist or wet materials. The system can be applied to any conventional conveyor system now in operation. Space for mounting turnover pulleys and accommodating the belt turn is all that is required.



Turnover belt system positions clean side on idler pulleys, stops buildup.

Meter Spots Motor Overload

INSTRUMENTATION has helped Bridgeport Brass Company reduce drawbench breakdown in brass tube and bar drawing operations at its plant in Bridgeport, Conn. Drawbench motors, operating at top speed, can develop enough torque at basic speeds to overload the bench because excessive torque is within the electrical rating of the motors.

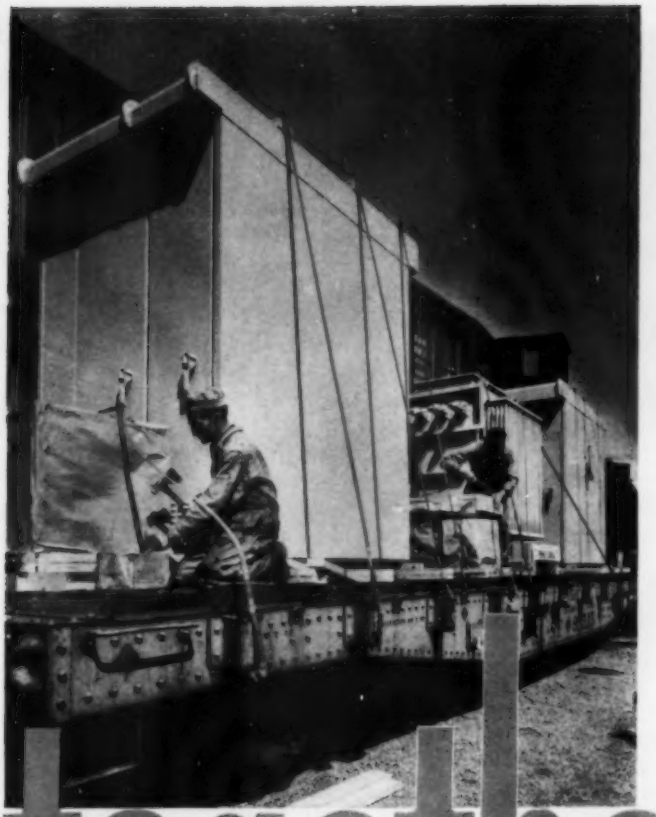
Bridgeport Brass engineers, after a study of the problem, asked General Electric Instrument Department engineers to help design an instrument to warn of overloads. The instrumentation developed by G. E. included the use of a d-c tachometer-generator, a d-c transformer and a strip chart recorder containing a modified two-element wattmeter to combine torque signals.

The instrument system records the deviations from maximum load. A drawbench operator, by occasionally looking at the recording chart, can tell when the operations are approaching an overload stage. A red zone on the recorder scale indicates an overload.

Insulation Stops Interruptions

NORMALLY, electrical insulations are used to solve problems with electrical apparatus. Such was not the case at Albany Asphalt & Aggregates Products. Combined solar heat and process heat from the kiln was raising havoc in an electric control panel located just a few feet from the firing end of the kiln, by causing circuit breakers to throw when no electrical overloads existed.

The problem was solved by the application of two Johns-Manville



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togetherness

*** shipped together.** You save both time and money with Pennsylvania's togetherness *of shipment.* Pennsylvania Secondary Unit Substation components are engineered, built and shipped together as a complete unit.

Our one-time shipment means one-time receiving. You eliminate expediting, follow-up and paperwork on several shipments from several locations. You eliminate temporary storage, and a chance of possible damage.

One-time shipment means that you pay for one-time use of special facilities and crews to handle substation components from the carrier to the site. There's no costly reshuffling of installation schedules.

These things save you money. Moreover, these savings are not always evident at the time of ordering. Therefore they represent hidden costs above and beyond the contract price for your unit substation.

Let us show you how Pennsylvania can save you time and money with togetherness. Write for Handbook No. PSG-559 to Unit Substation Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

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engineered
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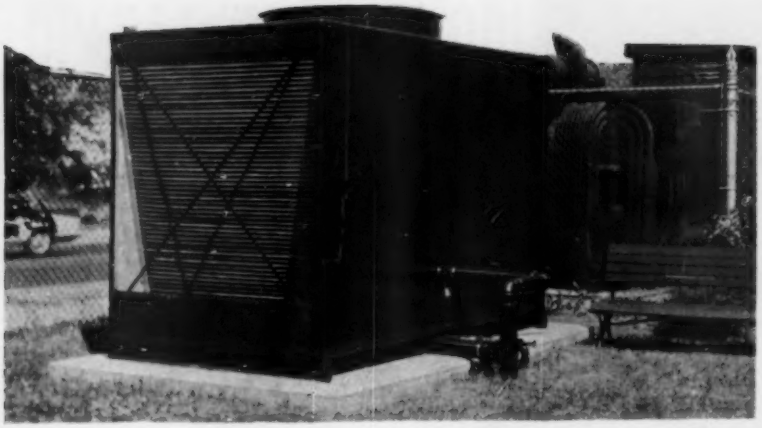
McGRAW EDISON

Circle 551 on postcard, page 33



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PERMATOWERS

are water cooling towers that

DEFY CORROSION

Now you can protect your company against unnecessary down-time, maintenance, and early replacement by installing the cooling tower that defies corrosion. It's called "Permatower" because it was designed to deliver years more of performance in any service, particularly under severe corrosive conditions of atmosphere or water. Marley engineers have replaced many vulnerable components with inert reinforced polyesters, epoxies, and protected laminates.

Permatowers come in a range of sizes from 15 tons up to provide cooling water for processing, air conditioning, refrigeration, steam condensers, compressors, welding equipment, quenching baths, molding presses, candy slabs, pasteurizers, electrical and electronic equipment. If you are now wasting water for any of these services, and if you want to solve the problem economically and *permanently*, get the facts on Permatower.

Your local Marley engineer will be glad to show you how a Permatower will pay for itself many times over the years. Look for him in the classified telephone directory or write for Bulletin PT-61 directly to

THE MARLEY COMPANY

KANSAS CITY 14, MISSOURI

Circle 552 on postcard, page 33

OPERATION—PRODUCTION

(O and P begins on page 76)

Thermally insulated control panel eliminates electrical interruptions.

insulating materials, 1½-in. thick Thermobestos blocks and 3/16-in. Asbestocite sheeting. This work eliminated the troublesome interference with normal operations, without the expense and bother of moving the control panel to another location.

Metal Cleaning Switches To a Lower Temperature

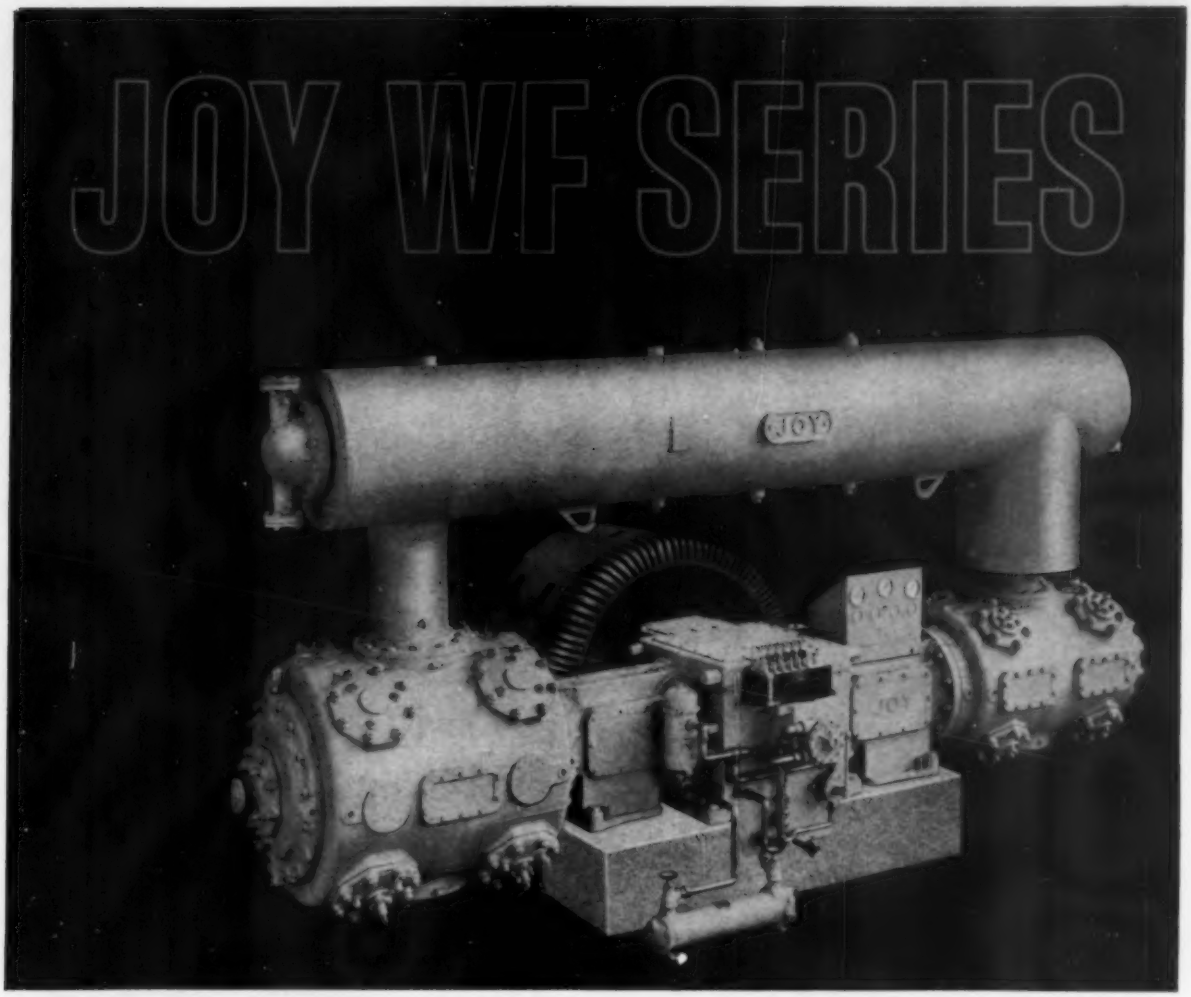
A BURN-OFF oven is a simple, economical method of cleaning sheet metal parts and, from an operating cost standpoint, it's hard to beat for simply getting rid of grease.

But a switch recently from a high-temperature burn-off method to a low-temperature metal cleaning system did pay off far more than just in the operating area at Lennox Industries, Columbus, Ohio.

It enabled the company to double processing operations through a single cleaning system and provided increased cleaning efficiency by also getting rid of the plant's soot and dirt, as well as grease.

A five-stage cleaning unit, coupled with a dry-off oven, designed and manufactured by R. C. Mahon Co. of Detroit, provided the benefits. They came about in an effort to avoid a dual processing system to handle needed rustproofing requirements for air conditioning units prior to painting.

Previously, the work, involving only furnace components, was handled through the burn-off oven at



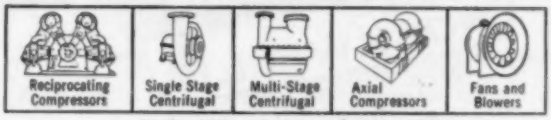
Announcing A Series of Horizontal Opposed Compressors in the 300-2000 HP Range

Designed for the great bulk of industrial air and gas applications, the WF series is the result of Joy's experience with over two and one half million compressor horsepower in the field. Every component is designed for dependability and ease of maintenance.

Installation and maintenance costs of the WF series are held to a minimum due to superior design. Since the motor rotor is mounted directly on the compressor shaft, alignment problems are minimized, installation is simplified, and less floor space is necessary.

The WF-102 air compressor pictured above has a displacement of 1972 CFM, and is driven by a 300 HP motor when discharging at pressures up to 125 PSIG. Larger models of Joy horizontal opposed compressors are also available as well as vertical, V-vertical, and turbodynamic machines. For additional information on the WF series write for Bulletin 3369-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

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Circle 553 on postcard, page 33

TERRIFIC MAINTENANCE TIME-SAVER!

Porter-Cable Porta-Band Saw

Cuts all metals—even grades of stainless and tool steels—fast, smoothly, clean, and in hard-to-get-at places. Cuts plastics, too, and problem materials. Zips through pipe, cable, castings, housings, metal lath, rods, bars . . . you name it, this Band Saw will cut it! And fast!

Well balanced, easy-to-use. Rugged 6.5 amp. universal motor, blade speed 240 sfpm. Ten blades available from 6 to 24 teeth per inch, standard and Hi-Speed Steel.

Take a good look at this Porta-Band Saw and ask your dealer for a free on the job trial. It'll pay its way over and over and over.

FREE CATALOG shows complete line of Porter-Cable tools and accessories. Write: Rockwell Manufacturing Company, Porter-Cable Division, N. Lexington Ave., Pittsburgh 8, Pa.

PORTER-CABLE MACHINE COMPANY
Subsidiary of Rockwell Manufacturing Company
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Porter-Cable
another fine product by
ROCKWELL

Circle 554 on postcard, page 33

OPERATION—PRODUCTION

(O and P begins on page 76)

700 F. Operating costs of the single-purpose system were $4.53 per hour. The new cleaning and rustproofing system operates at 90 F to 120 F for cleaning, and 400 F for dry-off of parts. The operating cost is $4.46 per hour.

Electromagnetic Packaging

NEATLY ALIGNED nails in compact 50-lb boxes are the result of a new electromagnetic packaging system placed into operation by U. S. Steel at its American Steel and Wire Division plant in Joliet, Ill.

This installation makes possible

Shown in this cutaway view are the nails as they appear during loading in electromagnetic packaging device.

the packaging of nails in large quantities in neat parallel rows. They flow down between two strong electromagnets which align and hold the nails suspended end to end and side by side in horizontal position until the desired quantity is reached. As the magnetic current is then momentarily interrupted, the nails stay in neat alignment and drop as one load.

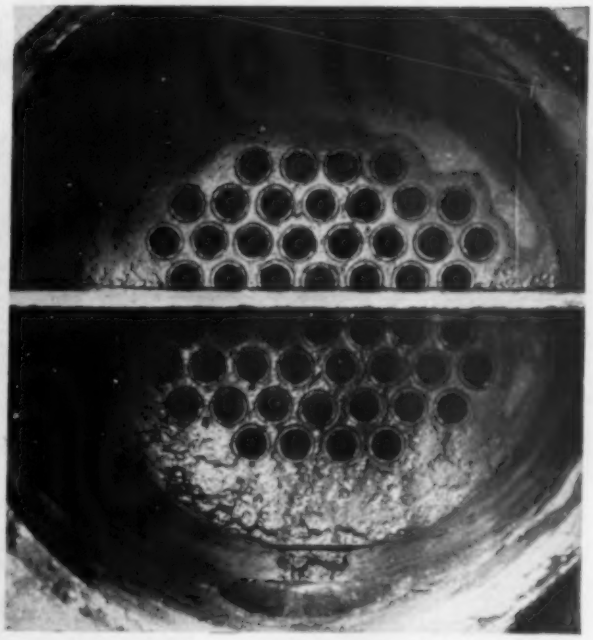
This system makes use of a box that requires 50 per cent less material than the former two-piece telescoping box for the same quantity of nails. Its cubic space requirements are also decreased by 10 per cent.

Magnetic Slug Catches Rejects

METALLURGISTS at National-Standard Company have figured out a quick way to catch the one spring out

Descale equipment quickly, safely, —without dismantling!

BEFORE—This condenser was badly clogged with hard-water scale. Mechanical cleaning of the tubes would have been difficult, time-consuming and costly. To use hydrochloric acid would pose danger to nearby equipment and personnel.



AFTER—It was easily cleaned *without dismantling* by circulating a water solution of a sulfamic acid-based cleaner for an hour. Short downtime, *no* danger to equipment and complete safety for personnel!

Use a dry-acid cleaner based on Du Pont Sulfamic Acid

They're effective. Dry-acid cleaners dissolve most water-side deposits found in condensers, boilers, compressor jackets, heat exchangers, etc. Yet they're much less corrosive to metal than hydrochloric-acid cleaners.

They're easy, safe. Just dissolve the solid cleaner in water and circulate through the equipment. No danger of broken carboys, spilled liquids or toxic fumes—glasses and gloves are the only protective clothing needed!

They're economical, fast. 1 lb. of dry cleaner does the job of 1.3 lb. of 28% hydrochloric acid—you save on shipping, handling, storage and downtime (because there's no dismantling).

Horizontal and vertical condensers, stills, compressors, etc., are readily and economically descaled in place with cleaners based on Du Pont Sulfamic Acid. Plant personnel do the job with a minimum of equipment.

Ask your water-treatment company's technical representative about dry-acid cleaners; chances are, he can supply you. Or send the coupon for booklet and names of formulators offering dry-acid cleaners based on Du Pont Sulfamic Acid.

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E. I. du Pont de Nemours & Co. (Inc.)
Industrial and Biochemicals Department, N-2545PE,
Wilmington 98, Delaware.

Please send your "Descale" booklet and names of formulators offering cleaners based on sulfamic acid.

*Name*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

Circle 555 on postcard, page 33

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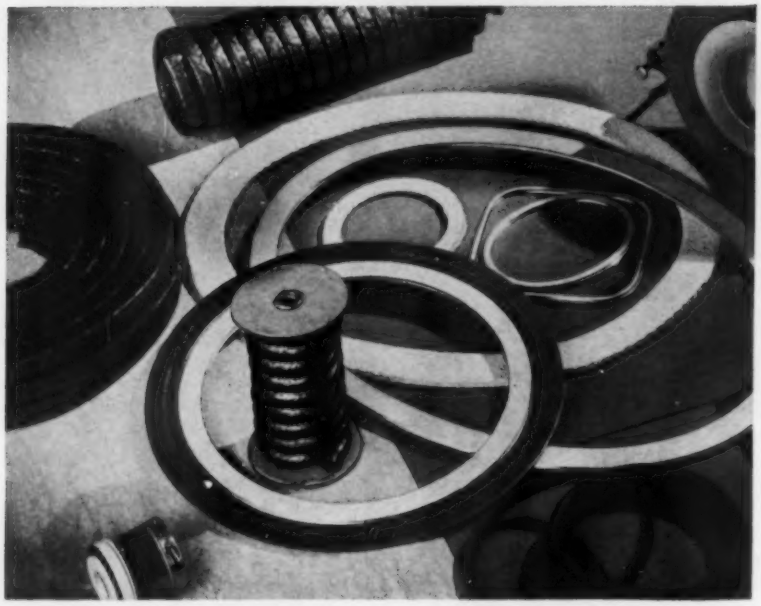
Find the Belmont Distributor nearest you in Conover-Mast Purchasing Directory or Thomas' Register Packing Sections



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Circle 556 on postcard, page 33

OPERATION—PRODUCTION

(O and P begins on page 76)

Welding magnetic slug into non-magnetic steel rod provides sensing that automaticaly rejects springs.

of hundreds in a production run that has a weld joint in it. The technique is based on using non-magnetic spring materials.

For example, they weld a slug of magnetic steel between 10- to 12-ft lengths of NS-25, a non-magnetic alloy spring material. It must be cut to these lengths for centerless grinding before drawing.

If they were not welded into longer pieces, the 12-ft length would only stretch each one to about 150 ft, too short for economic automatic forming. By welding with inserts, it is possible to produce coils up to 30,000 ft long. A simple magnet catches the one spring out of hundreds that has the joint.

Resin Dispensing Automated

HANDLING AND dispensing of epoxy tooling resins has always been messy, costly, and time-consuming for The Martin Company, Baltimore, Maryland. The conventional method of handling had been to dip small amounts of resin from a 55-gal drum and to pour it into the dispensing machine.

This always resulted in a certain amount of waste, the inevitable droppage in moving the resin from the large container to the smaller dispenser, plus the man's time to perform the operation.

To eliminate these undesirable conditions, a tank as shown in Fig. 1 was constructed. Midway in the tank is a platform mounted on a puncture-

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Now SIMPLEX technology brings polyethylene's outstanding characteristics to higher voltage applications.

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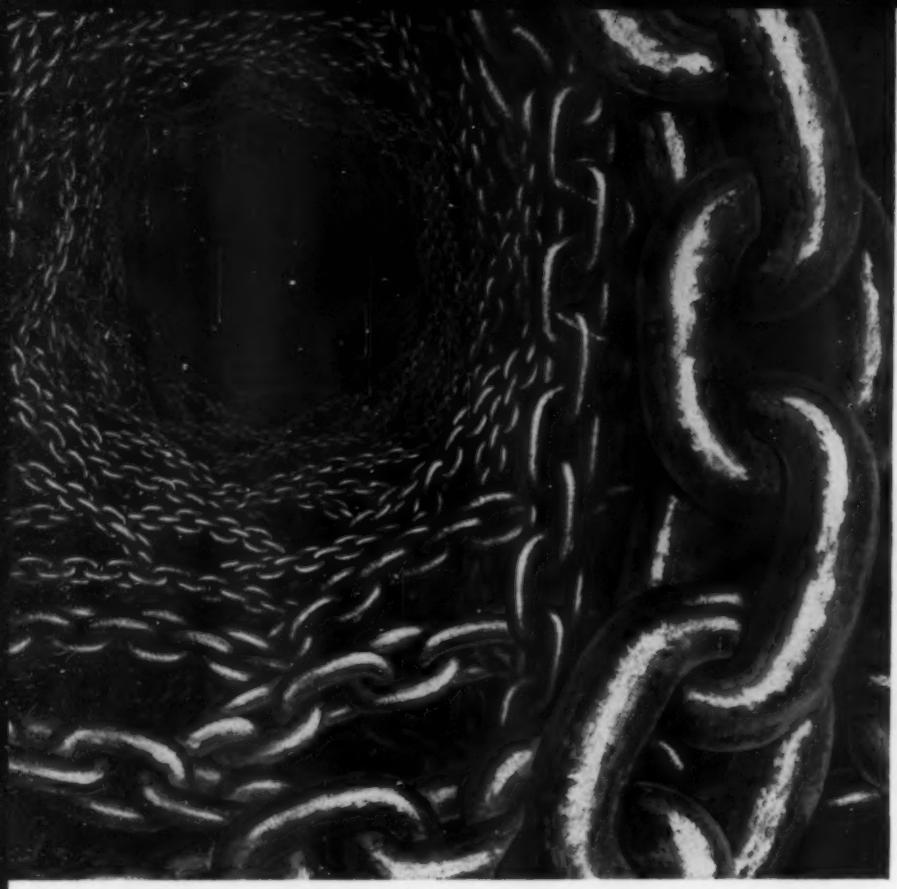
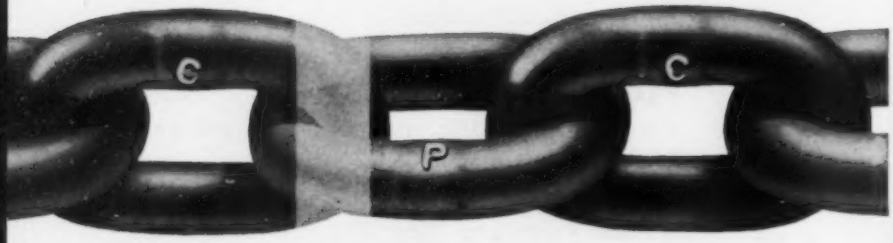


COOL OPERATOR . . . that's Campbell Chain in wet process cement kilns, because of its excellent heat transfer properties and high resistance to abrasion. Campbell Kiln Chain is one of many specialty items in the *complete* Campbell line of quality chain and chain assemblies, in every size and grade, to meet *your* particular needs.

Here is another example of a Campbell Chain development:



CAMPBELL "HALLMARK"® CHAIN — When you buy Campbell's "Hallmark" Chain you can *see* exactly what you're getting! It's permanently identified two ways: By GRADE—the grade mark is on alternate links; By MAKE—the Campbell "C" is on every other link . . . also with "MEASURE-MARK"® every five feet for your convenience.

For further information, contact your Campbell Wholesaler, or write direct

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THE ONLY CHAIN COMPANY WITH FACTORIES AND WAREHOUSES COAST-TO-COAST

OPERATION—PRODUCTION

(O and P begins on page 76)

pipe which extends approximately 2 in. above the platform.

The 10-gal resin container is simply dropped into the tank, the pipe pierces a hole in it and the resin empties. A circular seal to prevent contamination, cut from a flexible plastic board, is placed in the space between the container and the dispensing tank.

This method cuts handling time and eliminates spillage.

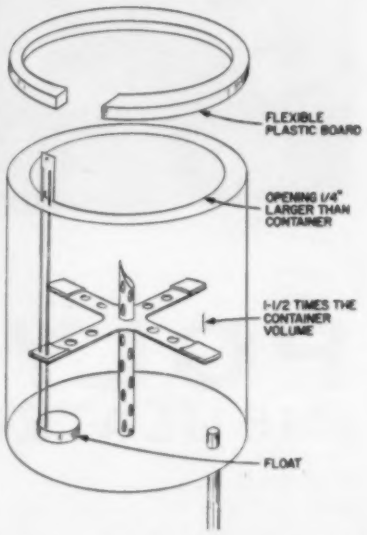

Fig. 1. Tank construction provides a simple method for handling resins.

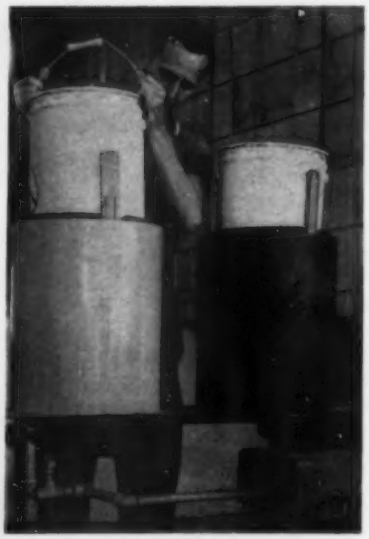

Fig. 2. Loading consists of dropping the 10-gal can of resin into the tank.

◀ Circle 558 on postcard, page 33

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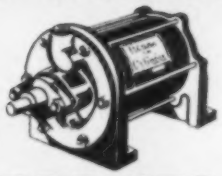
WANTED:
THE "OLDEST" HANNA CYLINDER



Hundreds of Hanna air and hydraulic cylinders built years ago are still in use. This year Hanna Engineering Works celebrates its 60th year as a manufacturer of air and hydraulic equipment. *You* can win a reward by finding one of the oldest, operating Hanna cylinders.

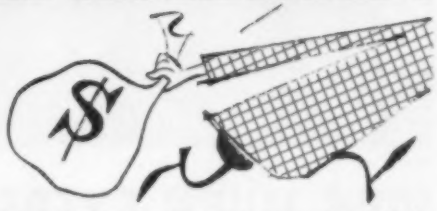
WHERE TO LOOK

Perhaps the oldest Hanna cylinder has seen service on several jobs around your plant. Frequently, when one job is finished, a Hanna cylinder will be moved to another job, because the cylinder still works as good as new. The oldest Hanna cylinder is typical of all Hanna cylinders built since—tough, sturdy, long lasting, built to take it.

FINGERPRINTS

Every Hanna cylinder built has been fingerprinted —its serial number has been entered on a permanent Hanna record. Its age, dimensions, mounting and construction details are on file. That's why replacement parts, if ever required, can be furnished exactly as needed. No slip-ups or costly delays when ordering parts for a Hanna cylinder.

REWARD:



If you have an old Hanna cylinder in your shop, fill in the coupon and mail it to Hanna Engineering Works. We will send you an official entry blank which qualifies you for one of three, one hundred dollar prizes for the person identifying the first, second or third oldest Hanna cylinder. The companies in which the three oldest Hanna cylinders are found will receive, for their next cylinder requirement, one new standard Hanna Powrmation or Powrdraulic air or hydraulic cylinder of any size up to eight inch bore. Mounting and stroke may be selected from the Hanna catalog.

Contest closes November 30, 1961. All entries must be postmarked before midnight of that date. Contest open to residents of United States of America only.

WARNING:

Don't look for the oldest Hanna cylinder on your maintenance records, or among purchase orders or requisitions for replacement parts. This Hanna cylinder might be buried or almost forgotten, simply because it has done its job so well for so long that it is taken for granted. Even parts that are normally replaced, like piston and rod packings, may not show up on your records because of Hanna's pioneering in the use of rod packings that compensate for wear and "sealed for life" automotive type piston rings.

I think we have one of the oldest Hanna cylinders. Please send me the official entry blank.

Name_____ Dept._____

Employed by_____

Address_____

City_____ State_____ Phone_____

MAIL TO:
Hanna Engineering Works, 1747 Elston Ave., Chicago 22, Ill.

HANNA ENGINEERING WORKS

1747 ELSTON AVE. • CHICAGO 22, ILL.

HANNA'S 60th YEAR

RAISING PRODUCTIVITY WITH FLUID POWER

EXIDE POWER PACKAGE

Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa. (ESB)

HOW MUCH EXTRA BATTERY LIFE CAN YOU GET?

You may be getting good battery life now. But the fact is that almost every battery can give better life if certain rather simple conditions are met.

Helping you to get maximum life, and therefore greatest economy, from your batteries is part of the Exide Power Package. The first step is selecting the particular type and capacity battery to fit the job. Your Exide man will recommend a battery capable of providing adequate power without the need for deep discharging. Knowing how to do this accurately is part of his special skill.

The Exide Power Package: Broadest choice of all types of batteries and chargers to meet all requirements, plus factory-quality service for both batteries and chargers.

To meet your particular requirements, he can draw from the broadest line of batteries for industrial truck power, including Exide-Ironclad with tubular positive plate construction; Exide-Powerclad premium pasted plate; and the improved Exide nickel-iron-alkaline (invented by Thomas A. Edison).

Second, it is important that the charger be able to recharge the battery completely within the allotted time, and at the desired rate. If a battery isn't adequately charged, it loses efficiency and its power output is reduced. At the same time, you must guard against overcharging too. Play safe. Ask your Exide man to recommend the right size and type Exide charger when you buy your Exide battery.

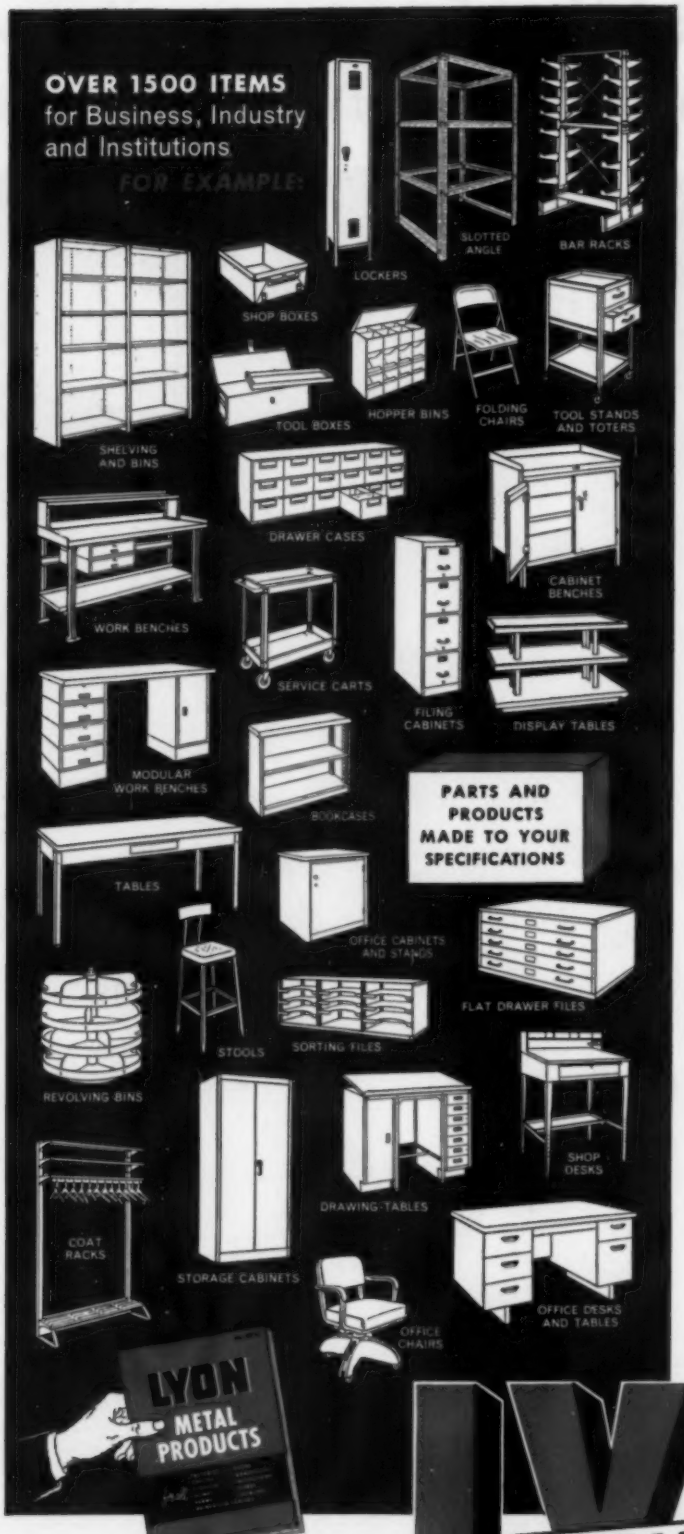
Third, make sure your batteries receive good upkeep. This involves more than just routine cleaning and watering. It means periodic inspection and checking by battery maintenance engineers. Exide service men will help you set up good battery maintenance schedules. They will diagnose problems which might develop—show you whether the cause is in the truck, the charger, the application, or the maintenance. And they will take care of any repairs or adjustments to batteries or chargers which might be called for. You get complete battery and charger service from one source, fast, thorough, dependable.

The combined effects of these three basic parts of the Exide Power Package mean not only longer battery life, but greater battery economy year after year. Find out exactly how you can benefit. Write Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Simplified electricity bulletin. Do you want to know how storage batteries work and what goes on as they charge and discharge? Send for this detailed bulletin. It's yours free. Also contains tips on how to keep batteries in top operating condition.

Exide®

Circle 560 on postcard, page 33



THIS CATALOG ILLUSTRATES THE WORLD'S MOST DIVERSIFIED LINE OF STEEL EQUIPMENT *IT'S FREE!*

5 TO 1 in '55

AND NOW IT'S 7 TO 1

In a preference survey made by an independent organization back in 1955, key men in companies throughout the country gave Lyon 5 times more first choice votes than any other steel equipment manufacturer.

In a comparable survey made in 1960, Lyon's first choice margin jumped to 7 to 1! And Lyon received more exclusive mentions than the next 22 companies combined!

Your nearest Lyon Dealer offers the world's most diversified and *most preferred* line of steel equipment—quality protected to give you the most for your investment.

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LYON® METAL PRODUCTS

Circle 561 on postcard, page 33

FOAMGLAS® Insulation . . . a better . . . a better insulation because

building material because it's **vaporproof** it's cellular glass

FOAMGLAS overcoats protect these huge outdoor uranium separating tanks for Algom Uranium Mines, Ltd., Canada. The tough Canadian winters cannot permeate the layer of FOAMGLAS, atmospheric moisture does not affect the cellular glass composition. Even corrosive acids resulting from this processing operation can never harm inorganic FOAMGLAS.

New FOAMGLAS-BOARD wraps all the benefits of FOAMGLAS in a 2′ x 4′ x 1½″ board that cuts installation costs. Sandwiched between sheets of special kraft laminated paper, the units reduce the number of roof insulation joints.

FOAMGLAS Stay-Dry Pipe Insulation designs the important benefits of FOAMGLAS into all building service lines—iced water, chilled water, low-pressure steam or dual temperature runs. In addition to the vapor and moisture protection, the insulation is fireproof, will not slump or sag. Permits installation of hangers around insulation.

No extra vapor seals are necessary with FOAMGLAS. It forms its own vapor barrier. That means a dependable seal against both moisture migration through the insulation and condensation within it.

Write for information on the complete line of FOAMGLAS products, and how they can work in your toughest applications. Address: Pittsburgh Corning Corporation, Dept. PE-101, One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, Quebec.

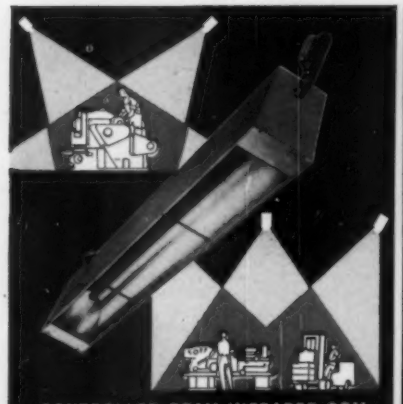
PITTSBURGH

CORNING

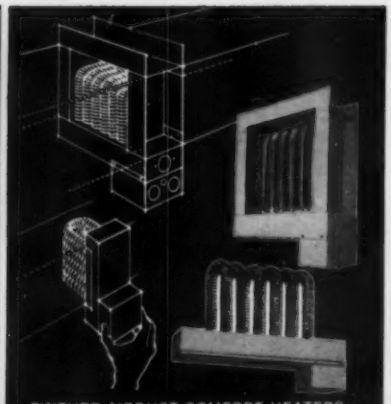
Circle 562 on postcard, page 33

CHROMALOX ELECTRIC COMFORT HEATING

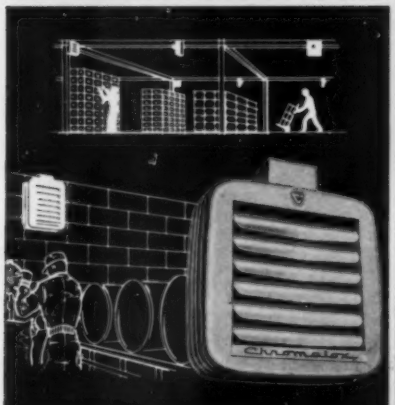
Clean, low cost, draft-free, maintenance-free heat for every imaginable comfort heating problem



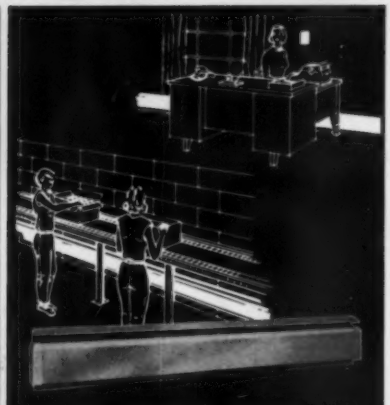
CONTROLLED BEAM INFRARED COMFORT HEATERS — Beam the heat where it's needed into exact "working zones" indoors or out. Positive comfort, easy installation, weatherproof.



FINTUBE AIRDUCT COMFORT HEATERS — The ideal heat source for central heating and cooling systems or for room-by-room, building-by-building temperature control, in new and old duct systems.



HEAVY-DUTY UNIT HEATERS — Keep men and materials at the right "working temperatures" for efficient production in large areas. For wall or ceiling mounting.



ELECTRIC BASEBOARD HEATERS — Uniform, clean, draft-free heat. Ideal for eliminating cold downdrafts of large window areas or poorly insulated outside walls.

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Chromalox Electric Comfort Heating Equipment gives quiet, clean, safe, maintenance-free comfort. It costs less to install; and because chimneys, ducts, boilers and boiler rooms are eliminated—you have more usable work area. Whether your needs are for heating entire buildings, for spot comfort heating in exposed areas, for portable units for temporary use, for ceiling mounted radiant or unit heaters, for permanent built-in perimeter baseboard panels, fan-driven wall insert heaters or unit ventilators . . . there is a Chromalox electric heating system which efficiently and economically solves your needs. Get in touch with your representative for more information.

FOR MORE INFORMATION
Write for Catalog F-975E.
It gives answers to permanent or temporary efficient electric comfort heating—indoors or outdoors.

WI-34

EDWIN L. WIEGAND COMPANY
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CHROMALOX ELECTRIC HEAT

PROCESS COMFORT

Circle 563 on postcard, page 33

How Nalco® High-Performance Coagulants Can Cut Your Water Treatment Cost... And Give You Better Water, Too!

Proper Clarification of Water Delivers Savings Throughout the System

Have you examined your clarification system on a realistic cost-performance basis lately? Have you taken into consideration rising costs of materials *and* labor? Such an analysis is the only valid method of determining what coagulation is costing you today.

Here at Nalco, it has been our experience that high performance Nalco coagulants show up the expense and inefficiency of older coagulation methods. An overall evaluation often shows that the "low-cost-per-pound" coagulants cost more per thousand gallons of clear, sparkling water . . . (water they will seldom deliver except under ideal conditions).

Efficient clarification is extremely important as a safeguard against high treatment costs in your supply lines, process equipment, cooling systems and boilers. Therefore, in assessing a clarification program, *all* factors affecting costs and potential savings must be considered . . . not overlooking freight, storage, feeding and performance figures.

Savings Begin with Chemicals to Fit the Job

Nalco's coagulant and coagulant aid chemicals are designed to fit feeding and water use requirements in both economy and performance. Sodium aluminate coagulants are: No. 2 Liquid, stable, highly-active and simple to proportion and use in liquid feeding equipment; Nalco 680 pure-white powder, ideal for use where chemical color is important; and Nalco 614 granular, high-activity, free-flowing sodium aluminate, used widely in municipal plants and other large-volume treatment applications. Nalco cationic, anionic and non-ionic polymer coagulants and coagulant aids are "heavy-duty" chemicals, used with Nalco sodium aluminates, with alum, or alone, depending upon the particular operating requirements of the system.

Savings Throughout the System

Fast formation of heavy, stable floc with Nalco coagulants and coagulant aids is basic in producing water that is trouble-free in use throughout the system. Some of the more common troubles Nalco-treated water prevent are: solids carryover of floc, sludge or alumina—and resultant plugging of pipes and equipment; corrosive or unstable water; and taste, odor and color carryover. While Nalco high-performance coagulants are not bactericides, bacterial content of efficiently treated water is significantly lower

J. T. Burke, Product Manager of Nalco Coagulant Chemicals Department, is a specialist in water clarification . . . One of the Nalco experts who have changed coagulation treatments from guess work to science.

because thorough coagulation traps a large percentage of microbiological organisms in the floc formation. As a result, waters need less bactericide treatment to meet requirements for low bacteria count.

Savings in Direct Chemical Costs

Chemical costs can be an important part of overall savings with Nalco high-performance coagulants and coagulant aids. The savings are significant in many plants. Two municipal plant superintendents report savings of $6,040* and $10,216* per year, respectively. A third plant reports that 1 ppm of Nalco 614 outperforms 10 ppm of alum*. In softening plants, chemical savings are often even greater, due to reduction in requirements for lime and soda ash, as well as coagulants.

**Itemized breakdowns of these savings are available on request. Also, there are probably similar figures on file for operating conditions closely parallel to your own.*

Savings with Expert Help

Nalco coagulation experts can cut the time and cost of setting up and proving out the coagulation chemicals and methods required to treat your water right. Nalco skills and experience in this field are unexcelled—and every Nalco Representative's basic products are water treatment results. Call him today, or write direct for Process Bulletin A1 . . . packed with facts and figures on coagulation in theory and practice.

NALCO CHEMICAL COMPANY

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Circle 564 on postcard, page 33

Engineering Building

Architects and Engineers:
Fellheimer & Wagner, New York

General Contractor:
Southeastern Construction Co., Charlotte, N. C.

Mechanical Contractor:
B. & G. Olsen Co., Richmond, Va.

Development Laboratory

Where Controlled Environment Counts, It's
JOHNSON PNEUMATIC CONTROL

... at Union Carbide Technical Center, for example

The new Union Carbide Technical Center in South Charleston, W. Va., is one of the most modern R&D facilities in industry today. It includes 12 buildings where over 1000 scientists and engineers carry out important assignments for Union Carbide Chemicals Company, Union Carbide Olefins Company, and Union Carbide Plastics Company.

A closely controlled thermal environment is especially important to the Center's operation, being essential to much of the experimental work as well as to the comfort and efficiency of the staff.

Specially engineered Johnson Pneumatic Control Systems help meet both types of demand with equal precision. Whether it's personal comfort in a private office, or special thermal conditions for individual projects in the Development Laboratory, the High Pressure Laboratory, or the Pilot Scale Laboratory buildings, Johnson Control maintains the exact air conditions required at all times.

Johnson Pneumatic Control is applied to all types and makes of air conditioning, heating, and ventilating equipment, and to a wide range of industrial processes. Next time you have a problem of temperature, humidity, or pressure control, investigate the advantages you get from a Johnson System — in performance, dependability, and lifetime economy. Johnson Service Company, Milwaukee 1, Wisconsin. 110 Direct Branch Offices.

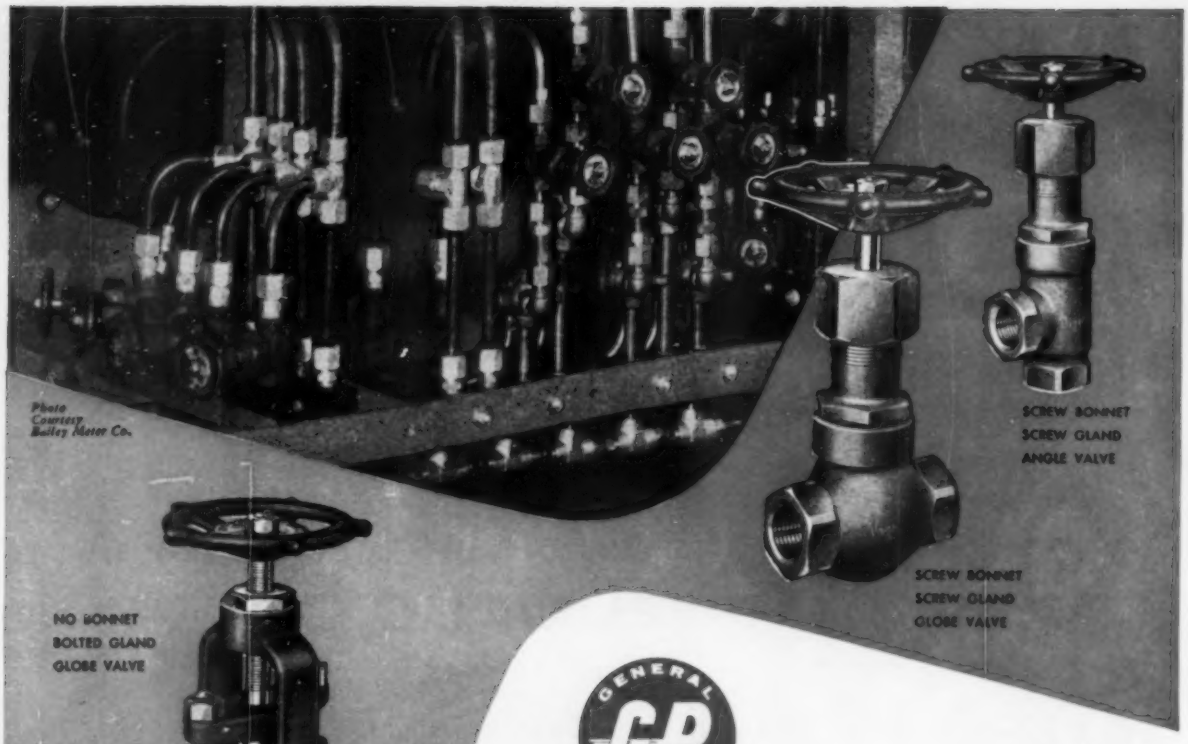
JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

A Johnson Pneumatic Control Center permits centralized supervision and control of air conditioning in the Engineering Building. Pneumatic indicators continuously display temperatures and pressures from all key control points. Remote adjustments may be made without leaving the panel. Selector switches place any system on either manual or completely automatic operation, as desired. In addition, local graphic panels, with temperature and pressure indication, are located in fan rooms adjacent to units. The system makes use of polyethylene tubing for compressed air piping.

Circle 565 on postcard, page 33



GENERAL GP PURPOSE

FORGED STEEL *INTEGRAL SEAT* METER AND GAUGE LINE VALVES

Union Bonnet, Screw Bonnet and No Bonnet Types

Service proved Vogt GP Forged steel valves are the choice of leading meter and gauge Manufacturers for top performance and unfailing reliability.

They are available in sizes from ¼" to 2" of carbon steel for general purpose duty and of all-stainless where highly corrosive liquids are involved. All stems are one-piece 13% Chrome Stainless Steel with fine pitch threads for accurate regulation of flow. Special packing is furnished when specified.

Catalog F-10 contains the complete Vogt line of valves, fittings, flanges and unions. Available upon request on your letterhead. Address Dept. 344-FPLE.

HENRY VOGT MACHINE CO., P. O. Box 1918, Louisville 1, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Los Angeles.

Vogt FORGED STEEL **VALVES, FITTINGS, FLANGES and UNIONS**

Circle 566 on postcard, page 33

CONSTRUCTION BRIEFS — reviewing methods and materials for the plant engineer

Edited by H. E. B. Anderson

PRESSURE SENSITIVE TAPES IN BUILDING

PERMANENT-TYPE pressure-sensitive tapes were developed primarily in response to a desire for a new answer to the joint problems in curtain wall and other structures. The principal advantage of a tape seal is that it will permit a wider range of movement between adjacent panels and still maintain a weather-proof seal.

Experimental work by Minnesota Mining and Manufacturing Co. was described by Paul H. Wilson of that company, at a recent conference of the Building Research Institute. They considered two completely different basic backings for tape seals: plastic and metal.

In one application of the test program, a plant building in Decatur, Alabama, was sealed with a polyvinyl-fluoride pressure-sensitive tape. The building walls were commercially available corrugated cement-asbestos siding. They were fortunate in that the structure had four identical companions erected at the same time with conventional joints, thus direct cost comparisons are possible, between the two methods.

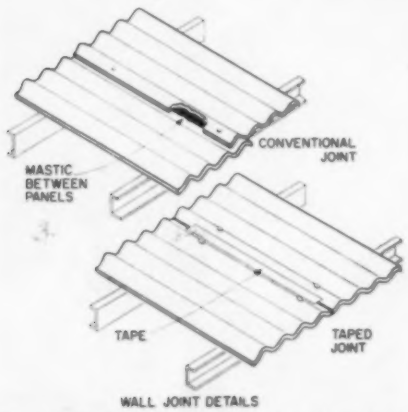


Fig. 1. Major differences in joints are butted panels, substitution of tape for mastic.

Figure 1 compares the two joint details. The principal difference is that the panels were butted for the tape joint and overlapped conventionally in the control joint. The following comparative savings were obtained: (1) the labor used in erecting the taped walls was one-third less—this saving was composed of a number of factors, the principal one seemed to be the elimination of any need to line up holes for bolting; (2) reduction of the normal breakage of 20 per cent down to 3 per cent for the test building —the conventional joint requires some springing of panels into place which tape eliminates; (3) there is an obvious saving of 8 per cent in that the overlap of the panels is eliminated; (4) although not done in this building, it appears possible that the center line of stiffening girts could have been eliminated because of the ability of the tape to take a high degree of relative movement.

Figure 2 shows another type of application: a warehouse roof in Minneapolis being sealed with aluminum-backed tape to prevent asphalt leaks in case of fire. Since steel is impervious, it is obviously not necessary to cover the whole roof with a sealing membrane, if adequate protection can be obtained at the seams and holes. The hatchet is used, of course, to press the tape down in the folds of the decking.

Figure 3 shows a penthouse containing air conditioning equipment on a plant in Chicago. The joint detail, shown in Fig. 4, was a conventional batten and sealant type for prevention of air leaks, which in this case was unsatisfactory. Aluminum-backed tape was merely applied over the edges, bolts and all, as shown; it could have been painted, for better appearance.

This is an experimental program. Unfortunately, a long history is not available for reference when new sealing tape applications are considered, but the uniform favorable economics and the improved design properties apparent in these examples lead to believe that tapes will take their place in the family of sealants in the construction industry. **End**

Fig. 2. Tape is used to seal joints of metal roof deck, preventing asphalt leaks through roof in case of fire.

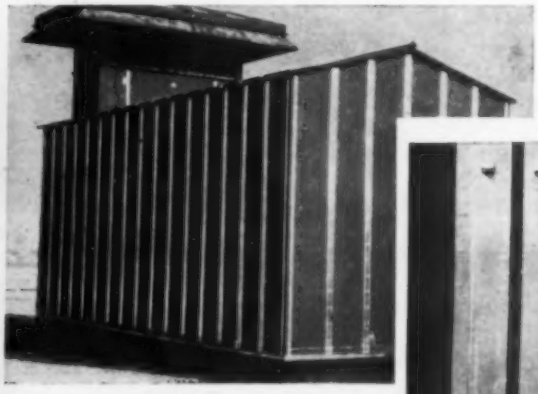
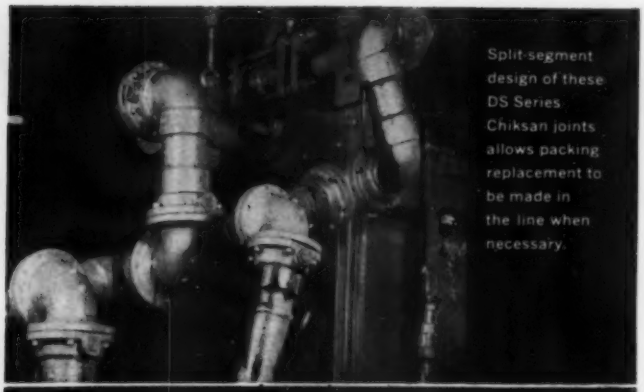


Fig. 3, 4. Batten-type joints in air conditioning penthouse are sealed airtight with aluminum-backed tape.

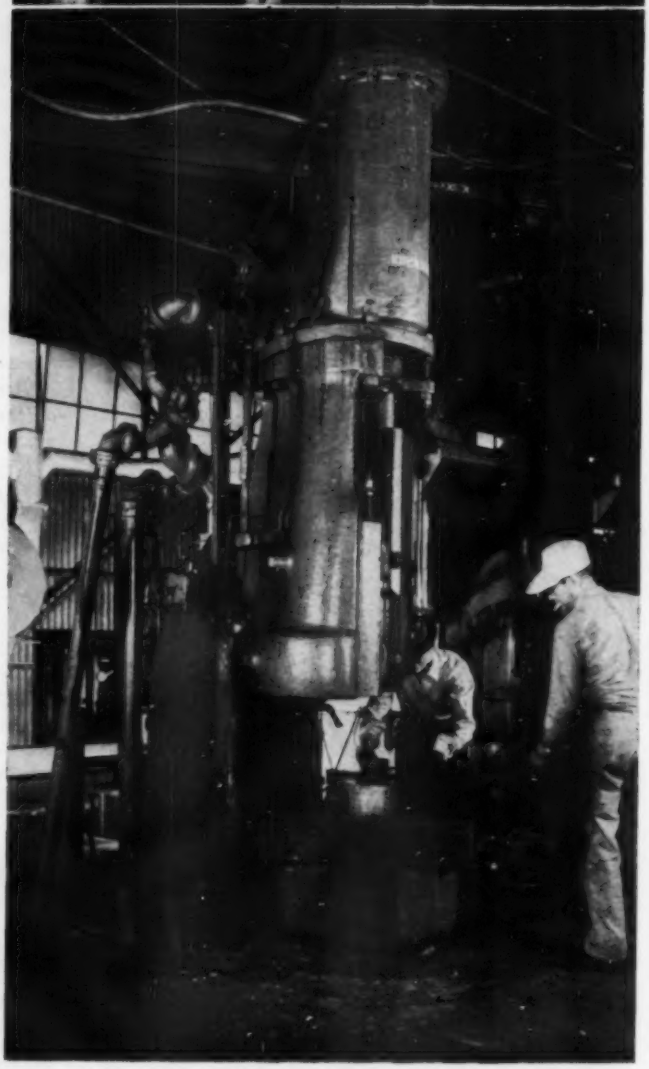
DESIGN SAFE, DURABLE FLEXIBILITY INTO YOUR LINES with CHIKSAN SWIVEL JOINTS

Whenever you apply Chiksan swivel joints, you get a line that lasts longer and reduces maintenance costs for years to come. Flexing in predetermined arcs, Chiksan joints eliminate common causes of line failure due to tight bends or torsional fatigue. Wherever certain designs require wide hose loops, Chiksan joints permit shorter, more compact lines. In fact, wherever fluid or air lines require flexibility, Chiksan swivel joints can provide a direct and lasting benefit.

Chiksan joints are available from stock in a wide range of materials, temperatures and pressures, to meet practically every design requirement. Write Chiksan Company, Brea, California, today for a catalog and the name of the representative in your area.



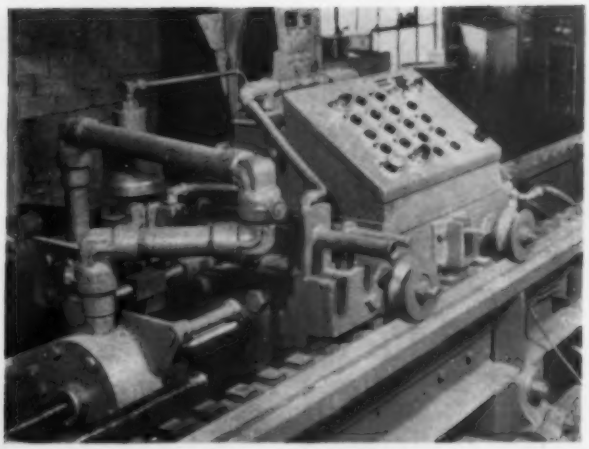
Split-segment design of these DS Series Chiksan joints allows packing replacement to be made in the line when necessary.



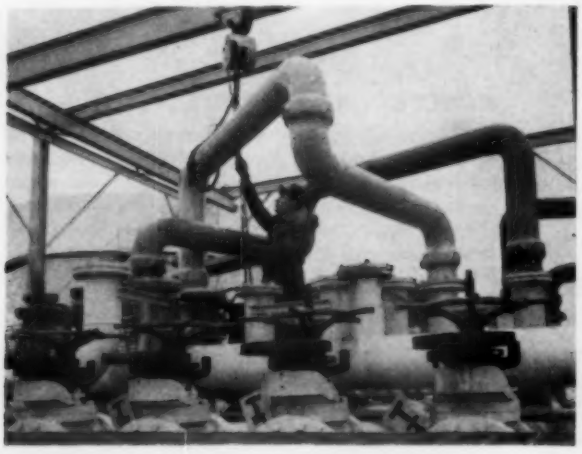
SHOCK, HIGH PRESSURE STEAM DOESN'T FAZE THESE CHIKSAN JOINTS—A 2000 pound dropforge with high pressure steam sets up a rough set of service conditions. These Chiksan swivel joints replaced flexible metal tubing which was going out in two and three weeks. Joints have been in service for over five months and customer reports good service to date, expects years more.

SEND FOR YOUR COPY OF THIS COMPREHENSIVE AND INFORMATIVE SWIVEL JOINT CATALOG.

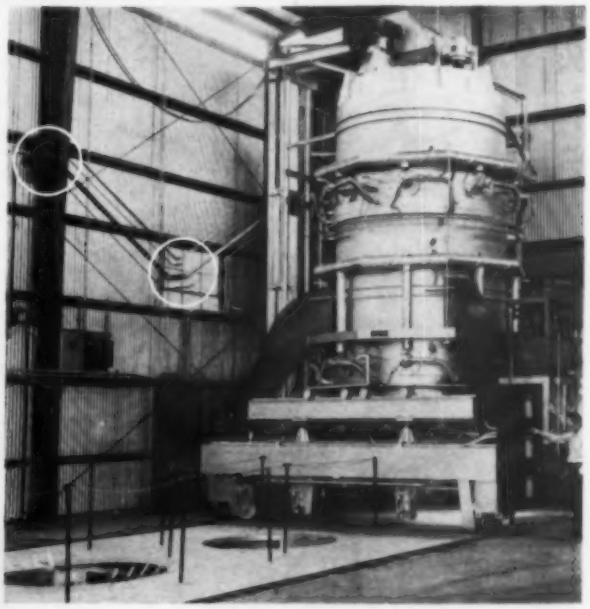
FLEXIBLE CHEMICAL LINES? CHIKSAN HAS THE ANSWER—Providing needed safety for a loading arm to handle sulfuric acid (as this Chiksan joint is doing) or most any chemical is an everyday occurrence with Chiksan joints. Over 2000 different types, styles and sizes in a variety of temperature and pressure ratings are available for your design needs.



RUPTURE PROOF LINES FOR HIGH PRESSURE HYDROTESTING—Critical lines take on a new measure of safety with these flexible steel swivel joints. In service on a pipe testing machine, these lines receive up to 1000 pounds of pressure and more every five seconds as lengths of new pipe move through the testing machine. Only occasional service is required to keep these joints in top working condition.

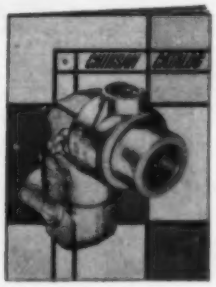


SWIVEL JOINTED JUMPER SYSTEM SOLVES MANIFOLD PROBLEMS—Moving large quantities of differing liquids from barge to storage tanks posed a problem. A closed system wasn't practical because of contamination due to leakage or accidental opening of a valve. Use of a Chiksan swivel jointed jumper system provided a solution that eliminated cross contamination.



CONSTANT FLOW CHARACTERISTICS ALLOW PRECISE CONTROL—Heat treating furnaces require exacting temperature control. Previous experience with flexible hose indicated too much variation in flow characteristics. By using swivel joints and metal piping, company engineers were able to design a supply line system that insured desired control.

#60-54



fmc **CHIKSAN** COMPANY • 330 NORTH BREA BLVD., BREA, CALIFORNIA

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

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Circle 567 on postcard, page 33

Steel City Channel MOUNTS— FOR SURFACE

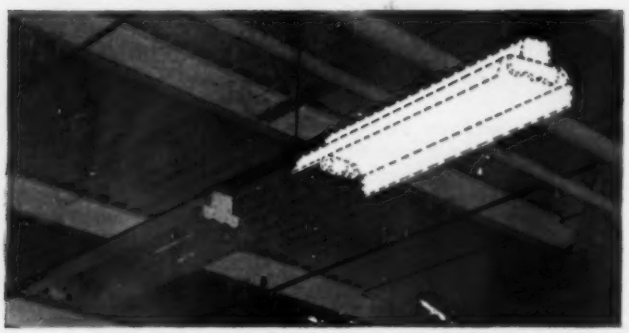
POWER TO SPARE—

A central wiring distribution channel with conductor capacity that exceeds requirements of any lighting layout and with power to spare for other uses. Here's a Channel that adapts to any interval of structural support—may be dropped to any level where it becomes a rigid platform for fixture attachment. Lighting fixtures may be spaced and fastened anywhere along the Channel System.

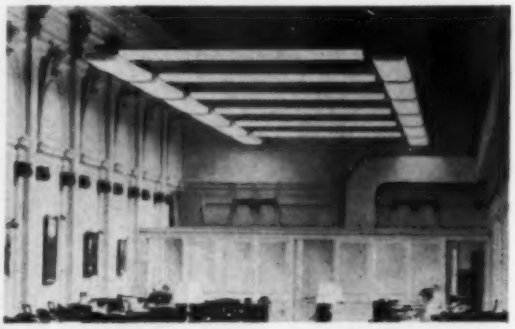
Branch lighting circuit conductors are completely enclosed in Channel from panel to fixture. This raceway carries full Underwriters' Laboratories, Inc. approval.

MONEY SAVING FEATURES . . .

● Eliminates cutting and threading of conduit ● Reduces number of hangers ● Uses existing boxes for wiring feeds ● Plug-in method reduces wiring costs ● The greater hanger spacing allows use of existing boxes with fewer intermediate hangers ● Pre-wiring of long lengths of channel at bench level ● Top mounted receptacles provide outlets for portable tools and machinery.



Fixtures may be added or relocated as required. To remove fixture, merely un-plug cord, open sliding fixture hangers and lower fixture. It's that easy.



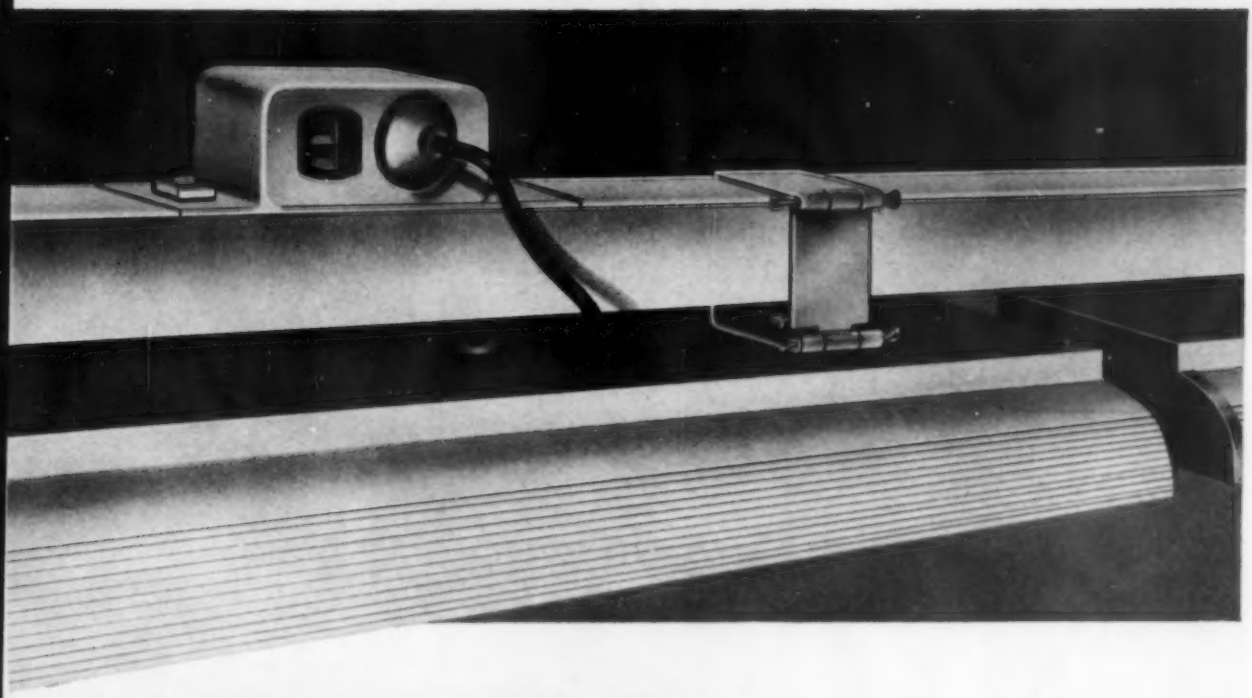
Steel City Channel mounts, hangs and feeds the fluorescent fixtures in the lighting modernization of a bank office.

Easy removal of fixtures for ballast repair and cleaning reduces maintenance costs.

STEEL CITY ELECTRIC COMPANY

A subsidiary of American-Marietta Company

PITTSBURGH 33, PA.



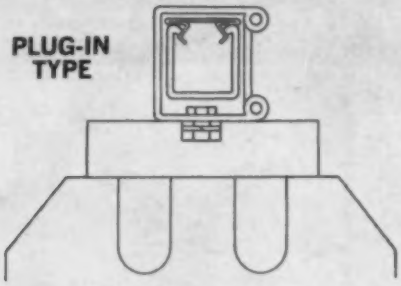
HANGS & FEEDS the fixtures
OR SUSPENDED LIGHTING

SURFACE RACEWAY SYSTEMS

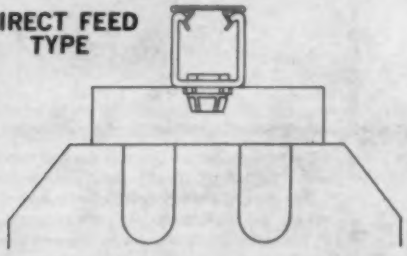
LISTED BY UNDERWRITERS' LABORATORIES, INC.

FIXTURE ATTACHMENT METHODS

PLUG-IN TYPE



DIRECT FEED TYPE



STEEL CITY CHANNELS

Channels of various depths and gauges, for use as surface raceway wiring systems or for fixture support only, are available as standard.

When used as a raceway, the Channel capacities are more than ample for every lighting requirement—up to ten No. 8 AWG conductors (National Electrical Code).

Steel City Channels and accessory fittings are protected by the GALV-KROM finish—an electrogalvanized finish PLUS added protection of zinc chromate. The GALV-KROM process imparts an attractive bronze lustre to the surface which does not require painting.

Steel City Electric Co.
Pittsburgh 33, Pa.

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Company_____

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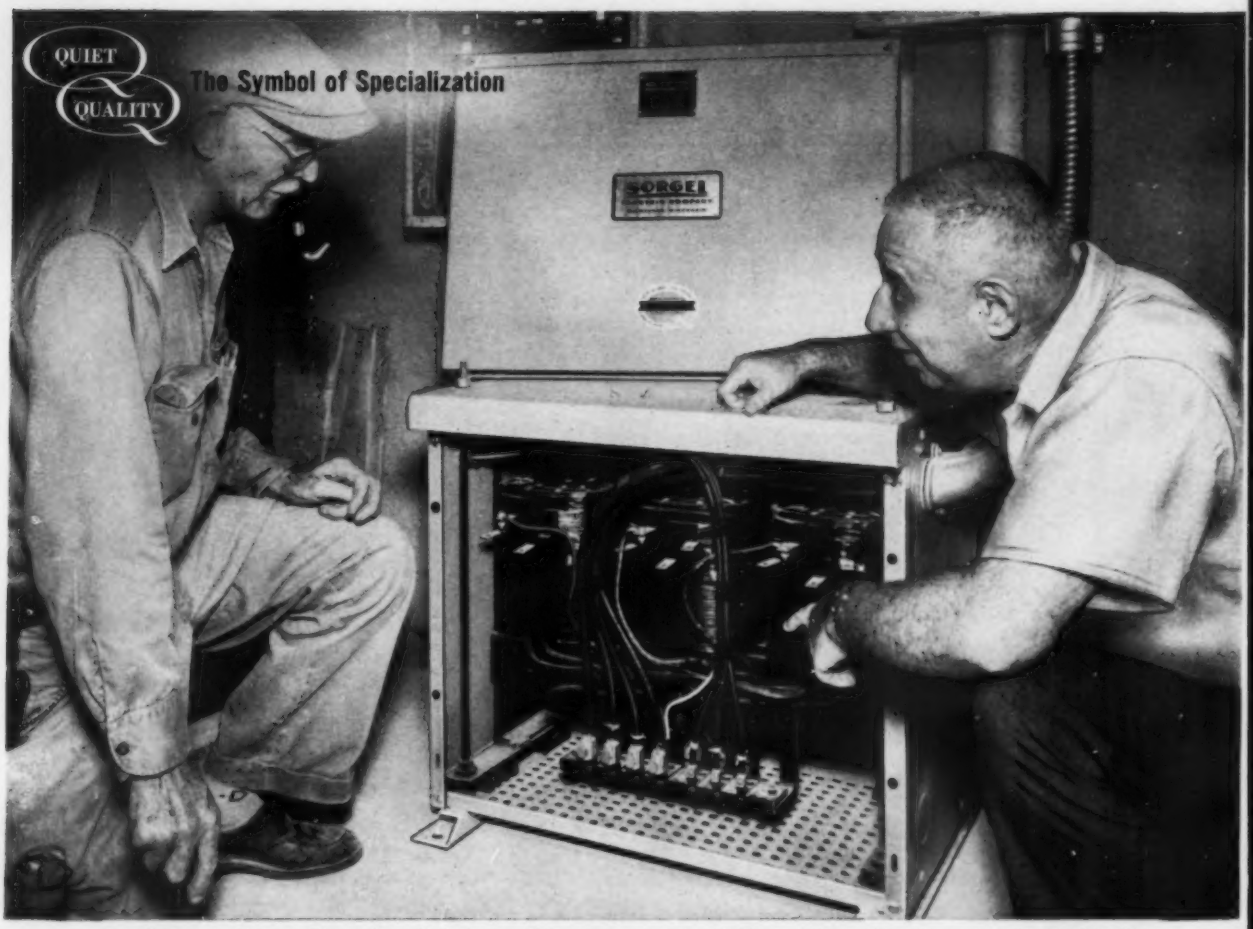
City_____ Zone____ State_____

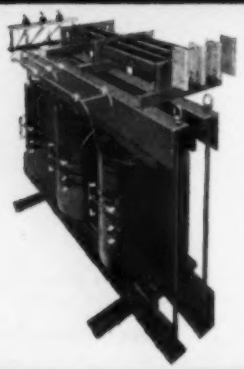
Circle 568 on postcard, page 33



Sam H. Deane, a 75-year-old pro, pictured left above with Sorgel representative, W. Chester Smith, took out his union card in Bluefield, West Virginia in May of 1915. Sam has been an active electrician ever since. In his experienced opinion, backed up by his fellow workers and his boss, John Potter, president of Diplomat Electric, Inc., Ft. Lauderdale, Florida, Sorgel transformers like this 75 KVA, 3 phase unit, are the finest in the field. Sam says the quiet level of operation, in addition to ease of installation, is one of the big advantages of Sorgel, especially in office, school and hospital buildings. He is an active member of IBEW Local 728 and installed Sorgel Transformers for Diplomat in the newly completed Broward County Court House job, in Ft. Lauderdale.

1/4 KVA
TO
10,000 KVA,
ALL STANDARD
AND
INTERMEDIATE
VOLTAGES
UP TO
15,000
VOLTS

SORGEL HAS A DRY-TYPE



True quality assures you of dependability and low cost operation, and is especially important in the heart of your entire electrical system. This 500 KVA, 5 KV class is a typical Sorgel core and coil unit for a unit sub-station.

Sorgel provides the most liberal designs and a coordinated system of either Class B, F, or H insulation, with the most effective use of quality materials to assure continuity of service. All units meet or exceed ASA, NEMA and AIEE standards. Shown above is a special 25 KVA Glober Furnace Transformer.

A Case History Report...

A FLORIDA ELECTRICIAN WITH 45 YEARS OF EXPERIENCE PREFERS SORGEL FOR 5 REASONS

A professional of 45 years knows his electrical products and these are Mr. Sam Deane's comments on Sorgel dry-type transformers, pointing up the economy and advantages to people like yourself who buy, specify and install transformers.

Fact No. 1—"It's easy to make good tight connections in Sorgel units because the terminations are securely anchored and there is ample hand working room. Another thing, these units aren't squeezed and jammed tightly into the case, which would be dangerous and would slow down installation time."

Fact No. 2—"When we begin installing a Sorgel unit, everything is ready for wiring. Their factory assembly, wiring and testing speed up our whole installation operation."

Fact No. 3—"The case design, location of knockouts, interchangeable wall or floor mounting and the built-in lifting eyes make positioning and securing a breeze for the contractor."

Fact No. 4—"The ventilation design is especially good as it prevents accidental access to live terminal parts. I also like the front cover design because it's easy to remove by means of simple captive bolts."

Fact No. 5—"Last, but not least, you are really proud to have installed a Sorgel unit because of its neat appearance. It definitely is the quietest in the field, never requires maintenance."

Ask your own area electricians and see if they don't agree with this professional of 45 years' experience on the Quiet Quality features of Sorgel units. It's advantages like these that are causing more and more consulting engineers, plant engineers and contractors to specify and insist on Sorgel day in and day out.

Contact your nearest Sorgel Sales Engineer for additional reasons why Sorgel units are truly your most economical buy —as quality pays, it doesn't cost.

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS

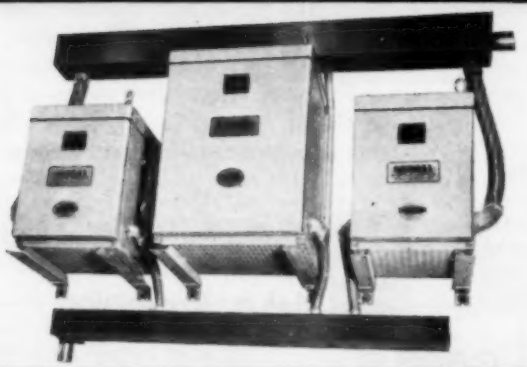
SORGEL ELECTRIC COMPANY

Since 1916 the pioneer in the development, manufacturing and application of sound-rated dry-type transformers

841 WEST NATIONAL AVENUE • MILWAUKEE 4, WIS.

Experienced sales engineers in principal cities

TRANSFORMER FOR YOUR EVERY NEED



Taking full advantage of Sorgel's interchangeable wall and floor mounting design, Diplomat Electric first used the built-in lifting eyes on these Sorgel units to raise them exactly to the selected mounting position nine feet above the floor. This unique bank of one 30 KVA and two 15 KVA units took voltage from a 480Y277 volt primary and provided secondary circuits of 120/240 volt single phase and 240 volt three phase.

CLIP AND MAIL FOR TECHNICAL BULLETINS.

- ☐ 611—Transformer Line
- ☐ 960—Substations
- ☐ 658—DC Saturable Reactors

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Circle 569 on postcard, page 33

(A) High-impact hard rubber container—built to take rough electric truck use and withstand extreme temperatures.

(B) Negative plate group scientifically designed to match stepped-up capacity of Silconic "Diamond Z" positive plates.

(C) Porous rubber separators maintain their shape—channels in rib design carry electrolyte to all plate areas.

(D) Plantainer—high porosity plastic envelopes give added protection to plates yet allow free flow of electrolyte.

(E) Glass tape insulation wraps plates horizontally and vertically to retain active material and give complete insulation.

(F) Silconic "Diamond Z" positive plates accept charge easily, offer up to 25% longer life.

(G) Arched bridge allows sediment to spread across entire bottom of container—helps eliminate shorting failures.

FROM GOULD® POSITIVE POWER

Extra strength for tough jobs is yours with the positive power of Gould electric truck batteries. They're precision engineered to meet the most exacting requirements—provide sure, steady power in the hottest plant, or in the coldest yard.

A complete line is stocked nationwide for fast delivery, and Gould field engineers are located in all parts of the country to assist you in battery application and maintenance procedures. For more information, write or call your local Gould representative. Sales offices and agents in continental United States and overseas.

A complete line of charging equipment available. Ask for free catalog.

More Power to you from GOULD

INDUSTRIAL BATTERY DIVISION

GOULD-NATIONAL BATTERIES, INC.

St. Paul 1, Minnesota

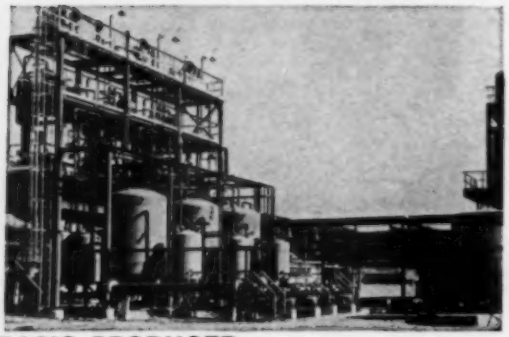
Circle 570 on postcard, page 33

Why you can be sure...

Celanese Cellulubes are the best functional fluids you can use

There are four practical reasons behind our claim that *you just can't buy better fire-resistant hydraulic fluids or air compressor lubricants than Celanese Cellulubes.*

1



BASIC PRODUCER—Celanese was the *first* to produce phosphate esters . . . and is the *only* producer currently marketing a series of industrial phosphate ester lubricants. Experience has demonstrated that we now have one of the best equipped plants in the country.

2

APPLICATION ENGINEERING—Our files contain facts about hundreds of successful Cellulube applications in many industries. Celanese engineers have the experience and interest to help you make the most of these functional fluids.

3

QUALITY CONTROL—Celanese zealously guards the quality of Cellulubes by a system of constant checks and controls. Physical and chemical properties are strictly maintained within exacting limits to assure you of optimum performance for fire-resistance and lubrication. What's more, Cellulubes have passed the most rigorous tests that the military and some of America's largest companies could devise.

4

TECHNICAL ASSISTANCE—Our technical staff provides assistance to see that the changeover from conventional fluids to Cellulubes is made as quickly and easily as possible. In many cases, our salesmen provide all necessary conversion know-how.

Fire-resistant Cellulubes are available in *six* controlled viscosities. Not only are they outstanding for the prevention of fire and explosion, but they give overall wear protection comparable to premium petroleum oils. Get the complete facts by using the coupon below. Celanese® Cellulube®

Celanese Chemical Company, Dept. 585-J
522 Fifth Avenue, New York 36, N. Y.

Please rush me a copy of your manual on Cellulubes as
☐ hydraulic fluids ☐ synthetic lubricants

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FM Factory Mutual-Approved (Cellulubes 150 and 220)

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Circle 571 on postcard, page 33

Now! Any old electric hammer is worth $60 or more trade-in

on a New Skil ROTO-HAMMER

...the hammer that revolutionized masonry drilling

Your Skil distributor is ready to give you a whopping big trade-in allowance on a new Skil Roto-Hammer—*the fastest, easiest, lowest cost way to drill masonry holes!* You'll actually receive $60 or more worth of Skil Hammer accessories as your trade-in for any old electric hammer, regardless of make, model or condition.

Two Roto-Hammer models are available —new, improved Model 726 (drills masonry holes from 11/64" to 1½" diameter); Model 736 (drills masonry holes from ½" to 3½" dia.).

See your Skil distributor NOW for complete information. *But hurry! This sensational trade-in offer is for a limited time only!* Look under "Tools—Electric" in the Yellow Pages. Or write: Skil Corporation, Dept. 120J, 5033 Elston Avenue, Chicago 30, Illinois.

SKIL POWER TOOLS

Only Skil Roto-Hammers have 3-way action

Hammers with automatic power rotation. For fastest, lowest cost masonry drilling without tedious hand rotation of star drills.
Hammers without rotation. For chiseling, channeling, slotting, demolition work, scores of hammering jobs.
Drills without hammering. For use same as a regular electric drill in boring wood, metal, other materials.

...and only Skil Roto-Hammers use 4 types of percussion-rotary bits...over 150 accessories in all for unequalled versatility!

Circle 572 on postcard, page 33

WHAT ARE YOU DOING ABOUT TOMORROW, TODAY?

A powerful torrent of scientific developments is inundating all of us in a flood of new ideas, terms, devices and combinations of devices. Lasers, masers, krasers, linear accelerators, thin-film memory circuits for fast, small computers—these are a few of the products and tools of scientific genius that are changing the lives of all of us.

While it is true that not all these developments are of immediate significance to the plant engineer, they are substantial shadows that foretell coming events. Intricate circuitry, devices with unbelievable manual dexterity, machines that diagnose their own ills, are either with us now or soon will be considered commonplace in every industrial plant.

The question now resolves itself: "What are you, as a plant engineer, doing to keep abreast of this torrent?" Can any of us project our own activities into the future that is almost here? Will we be ready, in a practical sense, to adapt, apply and maintain such scientific marvels as high-speed computer-controlled machinery and process equipment? Or will we be dragging our feet, believing that it can't happen to us?

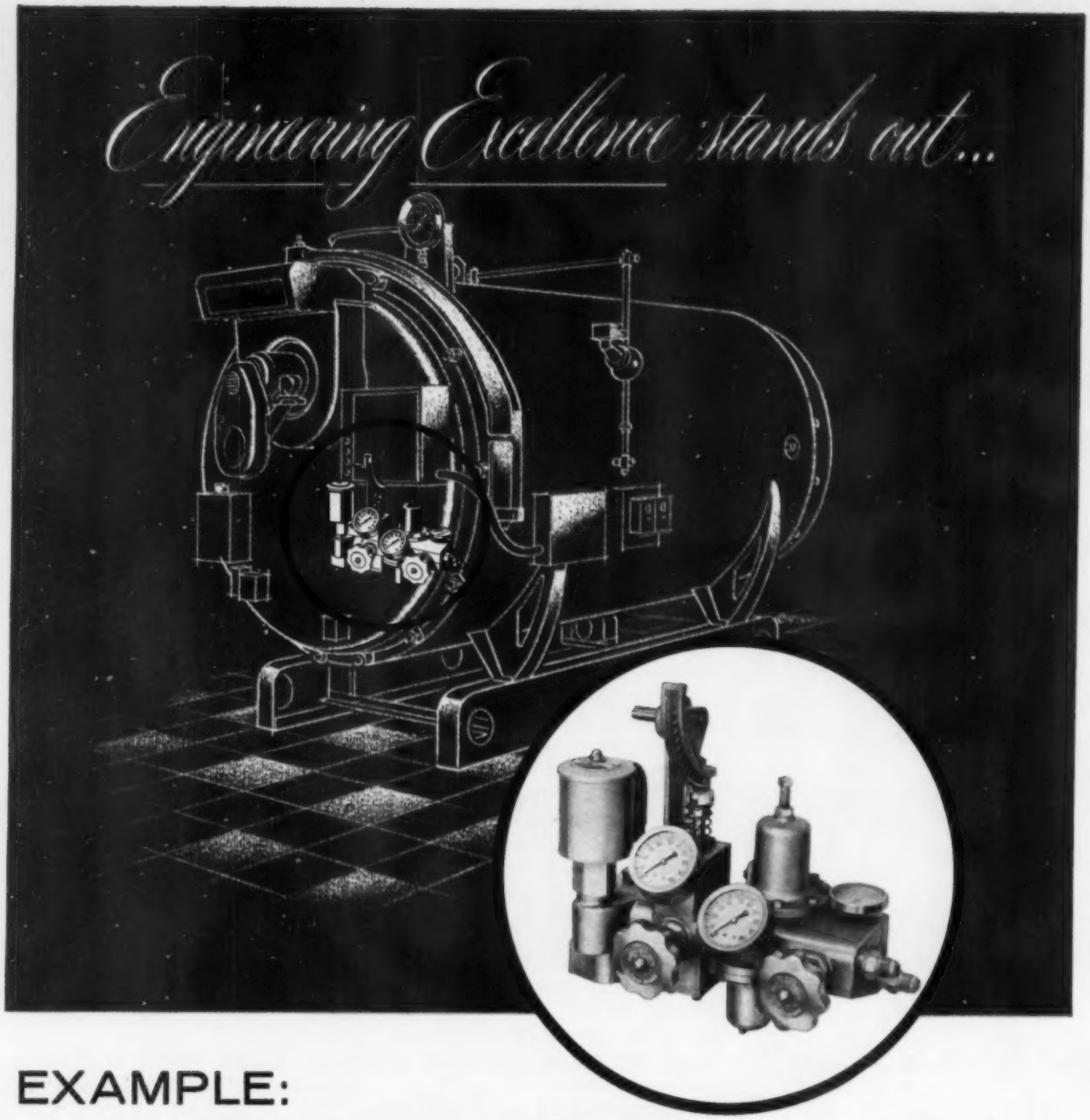
The plant engineer who doesn't seize this opportunity to lead the parade will soon find he is not even a part of it. New and highly specialized functions, manned by aggressive, imaginative engineers will rush in to fill this industrial vacuum. Don't let it happen to you.

At the present time you are in the driver's seat. You know your plant and its processes, you know its history and its products, you know its strengths and its weaknesses. You work with the other areas of plant management and are familiar with financial and competitive situations. Now it is up to you to take an aggressive part in equipping yourself and your plant with the best possible personnel and equipment. You should make it your business to keep up-to-date on all scientific developments through the media of technical and business publications, seminars, conferences and your AIPE programs.

The latter is an excellent forum to which you can attract, as speakers, authorities on new machine design, automation, static controls, computers, technician training and basic science.

It's a good idea to keep up with the developments that may affect your job and your plant's profits. It's a better idea to keep ahead of them. Today's challenge is far greater than yesterday's and it is going to take bigger and better men to meet it.

Tom Hanson



EXAMPLE:
Cleaver-Brooks exclusive *fuel oil controller*

The Cleaver-Brooks fuel oil controller is unique in the industry. It combines in one steel casting all the piping, gauges, regulators, and valves needed in the integral fuel oil control system. Leakage is virtually eliminated because this single assembly eliminates as many as 40 fittings and pipe elbows. There's a clean, uncluttered, efficient look to the head of every Cleaver-Brooks boiler.

Look to Cleaver-Brooks for many examples of engineering excellence in action. The single tip burner nozzle, so easy to remove and clean . . . the rotary air damper that gives precise control of air . . . the air nozzle purge . . . all are found exclusively on Cleaver-Brooks boilers, all contribute to greater efficiency in the burning of fuel. Good reasons why you should *insist* on Cleaver-Brooks.

Your Cleaver-Brooks agent has years of experience in boiler application. Contact him for more information on the features that exemplify the engineering excellence of Cleaver-Brooks.

Write for free booklet, "How to Select a Boiler."

Cleaver Brooks®

ORIGINATOR AND LARGEST PRODUCER
OF PACKAGED BOILERS

Dept. L, 364 E. Keefe Ave., Milwaukee 12, Wis.

PERFORMANCE PROVES THE ENGINEERING EXCELLENCE OF CLEAVER-BROOKS BOILERS

Circle 573 on postcard, page 33

PLANT ENGINEERING
October, 1961

WHAT'S JUST AHEAD IN THIS ISSUE

- INCREASED MECHANIZATION of many industrial operations has resulted in increasingly complex controls to operate such equipment. Static controls have been the answer. Although the "language" of static controls is quite similar, the systems designed by various manufacturers are not compatible. Starting on the next page is the first in a series of articles to acquaint plant engineers with the different types of static control systems.

- A THERMOMETER or a moistened finger won't do the trick if you want to measure industry's operating temperatures. Thermocouples, potentiometers and radiation pyrometers are taking over the chore . . . and their principles and applications are the subject of an informative article series beginning on page 117.

- THE UNIT LOAD is proving to be the answer to high handling costs for bulk materials. In the article starting on page 122, containerization—its applications and how they might fit your plant—is reviewed to help you select a system best fitted to your operations.

- EXCESSIVE NOISE—excessive in volume or pitch—can be detrimental to health and efficiency. Industrial plants are particularly vulnerable, and sound suppression is becoming increasingly important. In the article starting on page 126, the author outlines some of the design and construction features of sound suppressors.

- LUBRICATION and the systems that supply it are all-important to the efficient operation of compressors. Properly selected and applied, the components of lubricating systems can spell "success" in your compressor operation. On page 129 the authors describe the various components and tell how you might apply them to your compressors.

- WHAT YOU ARE filtering is an important factor in deciding what type of filter to use. From cotton fiber to porous metal, each filter media can do a particular job best. Look for your filtering problem—and its solution—in the article starting on page 133.

- WE ALL KNOW that some metals conduct electricity better than others . . . but designing a third-rail conductor system for crane power isn't just a matter of selecting the best conductor. Tests show that under some conditions, copper boosters on steel rails may actually decrease the current-carrying capacity of the rail. For more complete data, turn to page 140.

STATIC CONTROL IN INDUSTRY

Editor's Note: As labor costs spiralled upward over the last decade, competitive pressures have forced mechanization of many operations previously performed manually. Individual machines today are designed to perform operations automatically and groups of these machines are arranged with appropriate transfer equipment to form continuous production lines.

In this same period, electrical control circuits have become increasingly complex to satisfy the need for more intelligent control of machine operations. It is not unusual to find hundreds of relays employed in a single control panel to provide automatic control.

Failure of a contact or coil in any one of the many relays used invariably results in a complete work stoppage. Finding a defective component, with thousands of dollars worth of equipment standing idle, is a problem that plagues every plant engineer.

Twenty to thirty years ago, relay designs were more than adequate for the number of operations expected during the life of the relay. However, as time went on relay operations became more and more frequent. There seemed to be a limit to the number of operations which could be obtained from a relay in spite of everything the manufacturer did to increase relay life.

To obtain consistent and reliable operation of these more complicated electrical control systems it would be desirable to employ components with no moving parts to wear, no coils to burn out and no contacts to corrode. Once the need became clear, several leading control manufacturers developed and marketed control systems with these desirable characteristics.

Widespread application of these static devices has been hampered by the need to learn an entirely new control concept. Circuit development is based on logic theory using new and strange terms. In addition, most plant engineers are not too familiar with the inner workings of magnetic amplifiers, hysteresis loops, metallic rectifiers, transistors, capacitors and resistors. Static control devices available today use various combinations of these components.

To further complicate the problem, systems designed by various manufacturers are not compatible although the logic symbolism may be identical. In the past, a relay of any manufacturer could be used if it fit into the available space. This is no longer true as static control elements from a typical manufacturer may employ an entirely different principle than that used by a competitor.

To help plant engineers realize the benefits inherent in static control, your editors have rounded up a series of articles from outstanding experts in the field. These articles are designed to unravel much of the mystery that has surrounded static control since its introduction.

LOGIC REASONING

UNTIL recently the usual method of controlling electrical equipment automatically was by means of relays. If relay circuits are carefully analyzed it can be shown that all relay arrangements can be separated into four categories.

These are: normally open contacts in series; normally open contacts in parallel; normally closed contacts; and a memory device. The usual "start-stop" circuit is a memory device as it maintains an "on" signal until it receives an "off" signal and vice versa.

Design of static control circuitry is based on logic reasoning and plant engineers have been using this kind of logic for many years in designing conventional relay controls. As an example, take a relay circuit with contacts arranged in series, Fig. 1. In this circuit, contacts A (and) B (and) C must all be closed before current will flow to the control relay R. When A (and) B (and) C are closed, relay R becomes energized closing the contact R, which completes the circuit to the output.

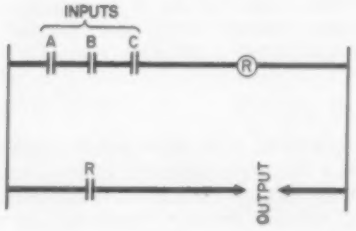


Fig. 1. With relay contacts arranged in series, inputs must be present at A and B and C to cause an output.

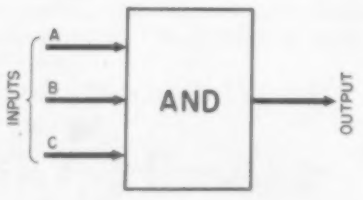


Fig. 2. In static control circuitry the AND element duplicates the function of relay contacts arranged in series.

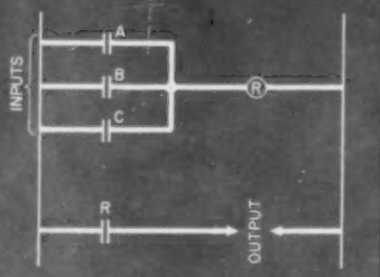


Fig. 3. With contacts arranged in parallel, inputs must be present at A or B or C to cause an output.

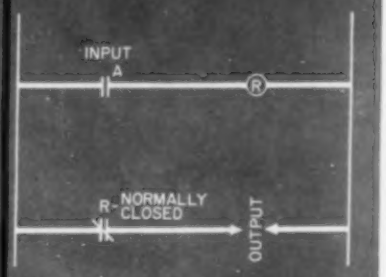


Fig. 5. A normally closed contact provides energy to an output whenever there is no input to relay R.

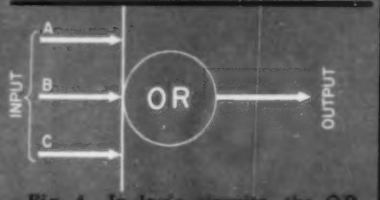


Fig. 4. In logic circuits, the OR element furnishes an output when inputs A or B or C are energized.

Fig. 6. In static control, the circuit is duplicated by a NOT element. No input produces an output.

In static control circuitry this situation is handled by using the AND element, Fig. 2. Without any knowledge of the internal circuitry employed, we can see that when inputs A (and) B (and) C are energized, we will have an output.

Another example is the situation where normally open contacts are arranged in parallel, Fig. 3. In this circuit, relay R will become energized when A (or) B (or) C, closes. When relay R becomes energized, contact R closes to provide a circuit to the output.

In logic circuitry this arrangement is duplicated by using the OR element, Fig. 4. When this unit is inserted into the circuit, an input at A (or) B (or) C will cause an output.

In a relay circuit using a normally closed contact we have a situation as shown in Fig. 5. When there is no input to relay R, the normally closed contact R completes a circuit to the output. When input A is energized, relay R becomes energized opening contact R and there is no output. Simplified, we can say when there is no input, there is an output and when there is an input there is no output.

In static control this is known as a NOT element, Fig. 6. When there is an input at A, there is no output. On the other hand, when input A is energized there is no output.

All plant engineers are familiar with the conventional "start - stop" circuit, Fig. 7, which is employed in hundreds of applications around a plant. However, I wonder how many think of this as a memory circuit. Let's see how it works. When the input "on" is closed momentarily, a circuit is completed to relay R. Relay contact R-1 closes, completing a circuit around the "on" input and this can now be opened. Relay contact R-2 also closes, completing a circuit to the output. As long as power continues to flow to this circuit it will remember the "on" signal until it receives an "off" signal.

When the "off" signal is operated, this breaks the circuit to relay R opening both contacts R-1 and R-2, breaking the circuit to the output. The circuit will now remain in the "off" condition until another "on" signal is received.

The MEMORY element used in static control performs this same function, Fig. 8. Inputs at "on" turn on the output and it remains on even though the "on" signal is removed. Similarly, an input to the "off" section turns off the output and it will remain off when the "off" signal is removed.

We can readily see that a great deal of logic is employed every day in the design of conventional relay control circuits. We are using AND, OR, NOT and MEMORY logic even though it is not identified as such. In practice, control application engineers find it easier to design circuits with logic elements even though they may later translate the circuit to conventional relay equipment.

Now that we have had this brief introduction to static control let's probe a little deeper and see exactly how the elements used in the Cypak system work.

Please turn page

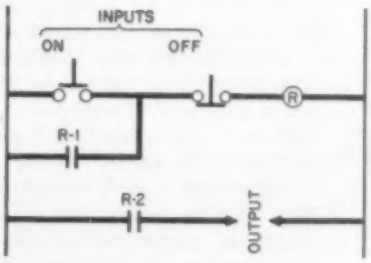


Fig. 7. Familiar "start-stop" circuit is a memory as momentary "on" signal holds output until "off" signal.

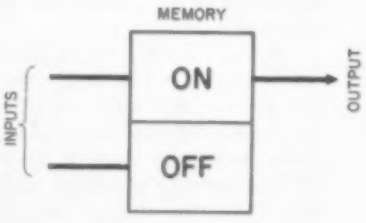


Fig. 8. The MEMORY element designed for static control duplicates function of the "start-stop" circuit.

STATIC CONTROL*— HOW IT WORKS

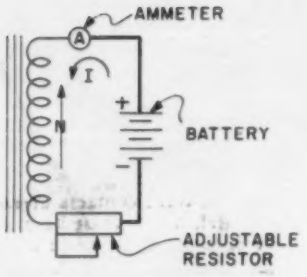


Fig. 9. If a wire is wrapped around a steel core and a current is passed through the wire, core becomes an electromagnet.

By **W. T. BAYLESS**, Control and Application Engineer
Westinghouse Electric Corporation, Youngstown, Ohio

IF A WIRE is wrapped around a steel core and a current is passed through the wire, the steel core becomes an electromagnet, Fig. 9. If a chart is made of the magnetizing strength it will look like Fig. 10. Before current starts to flow, the magnetizing strength is zero.

As current increases, magnetizing strength increases along the line OA. A current of 1/10 ampere may cause a significant change in the magnetizing strength at point 0, but as the curve approaches point A an increase in current of 1/10 ampere causes practically no change in magnetic strength. At this point the current has done all it can to increase magnetic strength and the core is said to be saturated.

We might say the top of the magnet in Fig. 9, is the north pole and indicate this with an arrow. As current is reduced the steel retains part of its magnetism so that the magnetizing strength is still at point B when the current drops to zero. If the battery leads are reversed and current builds up to the same value as at point A, curve BC is obtained.

Magnetism of the steel at point C is the reverse of what it was at point A as shown by the arrow pointing downward, Fig. 11. If the current is reduced to zero, the residual magnetism will be as shown at point D. If the battery leads are again reversed and current increased to the saturation point, the curve DA is obtained. Once more the arrow would point upward as shown in Fig. 9. The curve ABCDA is known as a hysteresis loop and its shape is important to the design engineer.

The shape shown in Fig. 10 might be transformer steel. In Cypak, a coil of very thin steel with special magnetic properties is wrapped with wire and is spoken of as a magnetic core. This steel is a product of Westinghouse research called Hypernik V. Its hysteresis loop is as shown in Fig. 12. It should be noted that a small change in current will change this core from the saturation point in one direction to the saturation point in the opposite direction.

It is necessary to understand saturation in order to know what the magnetic core will do under different conditions. Current flowing through the coil of wire produces a temporary change in the internal structure of the steel. In other words power which was originally stored in the battery has been used to give the steel power which it did not originally have.

There is a limit to the amount of power which the steel can absorb. When this limit is reached the steel is said to be saturated. The coil of wire wrapped around the steel no longer obstructs current flow, but permits it to flow freely. It is similar to a dam on a river. Until the reservoir is full of water the dam blocks the flow completely. However, as soon as the reservoir is full, it can store no more water and the river flows as though the dam were not there.

Cypak elements operate with the presence or absence of certain signals. If a Cypak magnetic core is unsaturated it will absorb power and there will be no output signal. However, if conditions are changed so that the core becomes saturated then there will be an output signal. Therefore, it is possible to control an output signal simply by controlling the saturation of a magnetic core.

In Fig. 9 it was assumed that current flowing downward through the coil would saturate the core with the north pole at the top. In the following discussion it can also be assumed that the magnetic condition of the core is known at all times. This condition

*This first in a series of articles on Static Control deals with Cypak, a product of Westinghouse Electric Corporation. Subsequent articles will deal with products of other manufacturers.

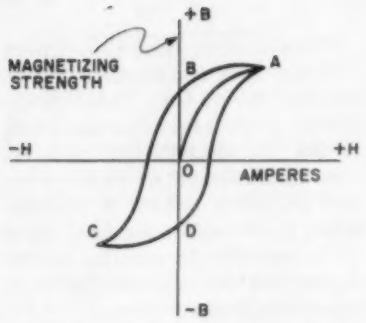


Fig. 10. Graph of magnetizing strength in core of circuit in Fig. 9.

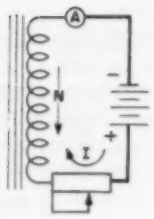


Fig. 11. Reversing direction of current reverses polarity of the magnet.

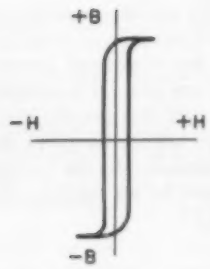


Fig. 12. Hysteresis loop of steel with magnetic properties called Hypernik.

will be indicated on each half cycle using the symbols shown in Fig. 13.

Cypak magnetic cores are made so that in one half cycle the core will change from saturation in one direction to saturation in the opposite direction. The circuit in Fig. 14 shows a magnetic core in series with a load connected to an alternating voltage V_{AC}. On the first half cycle the core is driven to saturation in the upward direction and on the next half cycle it is driven to saturation in the downward direction. This process continues, and there is never any output voltage present at V_L because the core is always absorbing all of the power supplied. In Cypak circuitry this would always produce no output signal.

Figure 15 is the same circuit as Fig. 14 except for the addition of a rectifier CR1. Magnetization of the steel is assumed to be in the downward direction. On the first half cycle in which current flows in the direction of the arrow, the magnetic core will change from saturation in the downward direction to saturation in the upward direction. During this half cycle the core is absorbing practically all of the power being supplied. Voltage across the magnetic core V_C is almost equal to the supply voltage V_{AC}, and voltage V_L applied to load L is practically zero. This condition is shown in the curves in Fig. 15.

On the next half cycle rectifier CR1 blocks current flow so that voltages V_C and V_L are both zero. The magnetic core remains saturated in the upward direction.

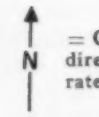
On the following half cycle, current again flows through rectifier CR1. The magnetic core is already saturated in the upward direction. It can absorb no more power and voltage V_C drops to practically zero. When this happens, current is limited only by load L and voltage V_L becomes practically equal to V_{AC}. Every time current flows in the direction of the arrow a voltage appears at V_L, thereby producing a half wave output signal.

Gating Half Cycle

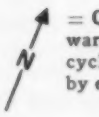
The half cycle in which current flows is called the gating half cycle. In Cypak circuitry this would always produce an output signal. Figures 14 and 15 are quite similar, but they give opposite output signals. In order to make these circuits useful in Cypak, a way must be found to combine these circuits and control the output.

Figure 16 shows a magnetic core with two coils wound on it. The right hand circuit is identical to Fig. 15. The left hand circuit is similar and is called a reset circuit. Wave forms show that current flows through CR1 and CR2 in alternate half cycles.

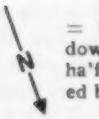
Gating voltage V_G is always present, and when current flows in CR1 it is assumed that the core saturates in the upward direction. On the next



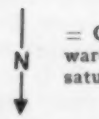
= Core is saturated in upward direction and remains saturated.



= Core is not saturated in upward direction at start of half cycle but becomes saturated by end of that half cycle.

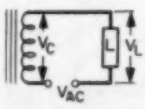


= Core is not saturated in downward direction at start of ha'f cycle but becomes saturated by end of that half cycle.



= Core is saturated in downward direction and remains saturated.

Fig. 13, left. To simplify explanation, symbols indicate condition of cores.



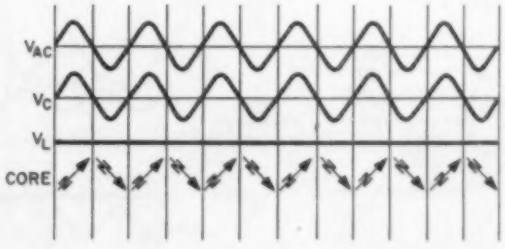


Fig. 14. Core in series with a load connected to an alternating voltage.

half cycle, current flows through CR2 in such a manner as to saturate the core in the downward direction.

Since the point of saturation of the core is just reached on both gating and reset half cycles all of the power will be absorbed by the core and there will never be an output voltage V_L across L.

Core Resetting

However, if the wave form V_R is removed there is no way of resetting the core on the reset half cycle and the core stays saturated in the upward direction. On the next gating half cycle the coil will not absorb any more power and there will be an output voltage V_G across L. With a reset voltage V_R present there is no output signal at L; and with no reset voltage V_R present there is an output signal at L. This corresponds to "off" and "on" signals. This is the circuit, with certain modifications added, which is used for a Cypak NOT module.

The circuit shown in Fig. 17 has provision for an input voltage which Fig. 16 did not have. In this circuit the gating voltage V_G and the reset voltage V_R are present at all times. The input signal V_I is higher in voltage than V_R and it must be present in the same half cycle as V_R above the zero voltage line.

Without an input signal V_I, V_G saturates the core in the upward direction on one half cycle and V_R saturates the core in the downward direction on the next half cycle. The core oscillates between saturation in the upward and downward direction and there is never any output voltage V_L across L.

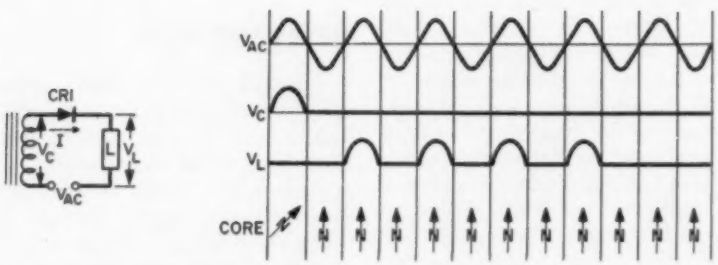


Fig. 15. Same circuit as shown in Fig. 14 except for the addition of rectifier.

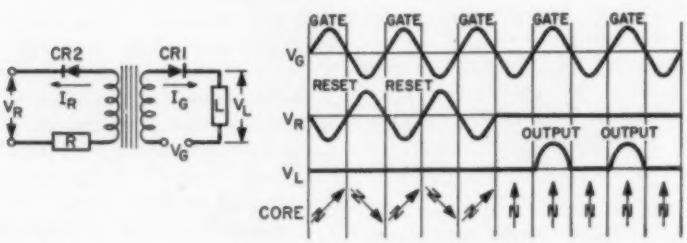


Fig. 16. Magnetic core with two coils. Second coil is called a reset circuit.

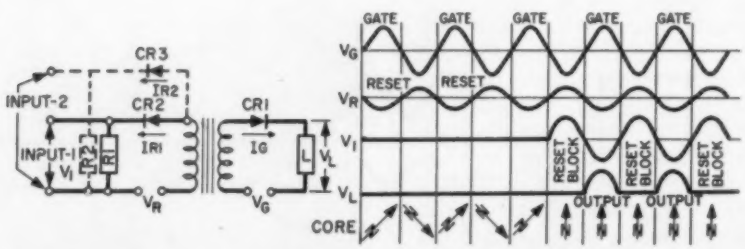


Fig. 17. Providing input circuit makes AND unit. Second input shown dotted.

When an input signal V_I is applied it blocks V_R so that the resetting current I_{RI} cannot flow. Therefore the core stays saturated in the upward direction. On the next half cycle the core cannot absorb any more energy and an output voltage is produced across L. As soon as the input signal V_I is removed the resetting current I_{RI} can flow once more and the output signal disappears.

One and Two Inputs

This is the circuit, with certain modifications added, which is used for a one input AND module. When an input signal is present an output signal is also present and vice versa. If another rectifier and resistor were connected as shown in dotted lines there would be two paths for resetting current to flow. Then it would be necessary to have input voltages applied at both input terminals before the resetting circuit would be blocked.

This would be the circuit for a two input AND. It is named in this manner because input —1 AND input —2 must both be present in order to produce an output signal. Any number of circuits may be added to the magnetic core as shown above to produce an AND element with the desired number of inputs.

It should be noted that there is a time delay of ½ cycle between the input signal and the output signal. When an input signal is applied it immediately blocks the resetting current but there is no output signal until ½ cycle later, when the gating voltage wave is above the zero voltage line.

Rectifiers are the devices used as Cypak OR elements, Fig. 18. Since rectifiers permit current to flow in one direction and block current flow in the reverse direction, they are ideally suited for use where two or more signals are fed to a common point. Sneak circuits, which frequently cause so much trouble in relay panels, are no problem in Cypak because the OR elements block them. There is no time delay between the input and output signal and a signal at either input —1 OR input —2 will produce

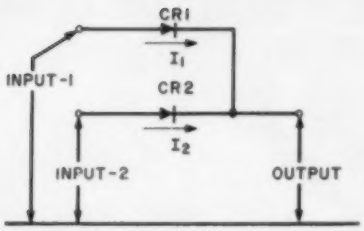


Fig. 18. Rectifiers are suited for use where signals feed to common point.

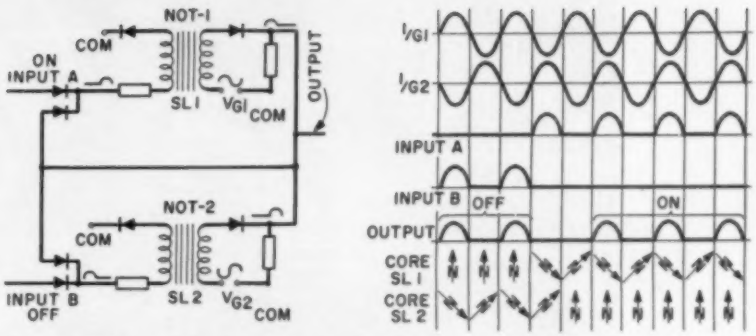


Fig. 19. Memory circuit. When this device is turned to the "on" position, it stays until it is turned to "off". Two NOT or two OR circuits are used.

an output signal. Any number of rectifiers can be combined to produce an OR circuit with the desired number of inputs.

Figure 19 shows a Cypak memory circuit. When this device is turned to the "on" position it stays in that position until it is turned to the "off" position. Two NOT and two —2 element OR circuits are combined to produce a memory circuit. Suppose that the memory device is initially in the "off" position and input B has been removed. If an input A signal is supplied to turn the memory unit "on" it will reset the magnetic core of NOT-1. Therefore there will be no output from NOT-1 on the next gating half cycle of V_{G1}.

Memory Circuit

Since there is no input B signal at NOT-2 the magnetic core is not reset and there will be an output signal from V_{G2} on its next gating half-cycle. It should be noted that the output of NOT-2 is the same wave form as the input A signal. A path is provided so that the output signal from NOT-2 may provide the input signal to NOT-1. Therefore, the input A signal may be removed and the memory unit will remain in the same condition. This output signal will also be fed to the input of NOT-2 but it will have no effect on NOT-2 since it is not of the same wave form.

When an input B signal is supplied, a similar line of reasoning will show that the output wave form will change. This new output wave form will be the same as the input B wave form so that it will reset NOT-2 after input B has been removed.

Arrows show that the magnetic core SL1 stays saturated in the upward direction until input A is applied. Therefore it produces an output voltage each time the V_{G1} voltage wave is above the zero voltage line. Output of both NOT units are tied together so that either one can provide the output signal from the memory unit.

The magnetization arrows show that until input A is applied, the magnetic core SL2 is constantly being saturated in one direction and then the other direction. Therefore there is never any output voltage from SL2 because the reset winding is constantly resetting the core. After input A is applied the two cores function in opposite fashion. It should be noted that there is a one cycle delay from the time the "on" signal is applied until the memory unit actually produces an "on" output signal.

A time delay function is frequently required in operations which must be performed in a certain order. Figure 20 shows the circuit used in Cypak. C_1 and C_2 are capacitors and C_2 is large compared to C_1. The input voltage must be ½ cycle and either wave form will operate the time delay unit.

On the half cycle when current flows, capacitors C_1 and C_2 will become charged. C_1 will receive a large charge and C_2 will receive a small charge. On the next half cycle the input voltage is zero and capacitor C_1 will discharge through resistors R_1 and R_2. Rectifier CR_1 prevents capacitor C_2 from discharging.

On succeeding cycles capacitor C_2 becomes charged more and more until it reaches the point where sufficient current can flow so as to change the output state of the memory unit which is connected to the time delay unit. Length of the time delay is changed by means of the adjustable voltage resistor R1. The Zener diode prevents the capacitor C_2 from getting an excessive charge.

Circuits Modified Slightly

The above components are the main elements used in Cypak. It should be clearly understood that the circuits which have been used in explaining the operation of Cypak are not the exact circuits used in Cypak systems. In order to use a few standard modules in a large variety of combinations it has been necessary to make certain modifications to the basic circuits. However, they are of such a minor nature that they should cause no confusion to anyone who understands the basic principles of Cypak.

Cypak elements which have been discussed operate at a low power level. Output voltage is 15 volts and output current is usually a few milliamperes. When all conditions have been satisfied for operation of some piece of apparatus the signal is amplified so that the apparatus is connected to its power source. **End**

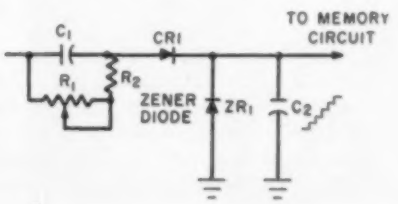
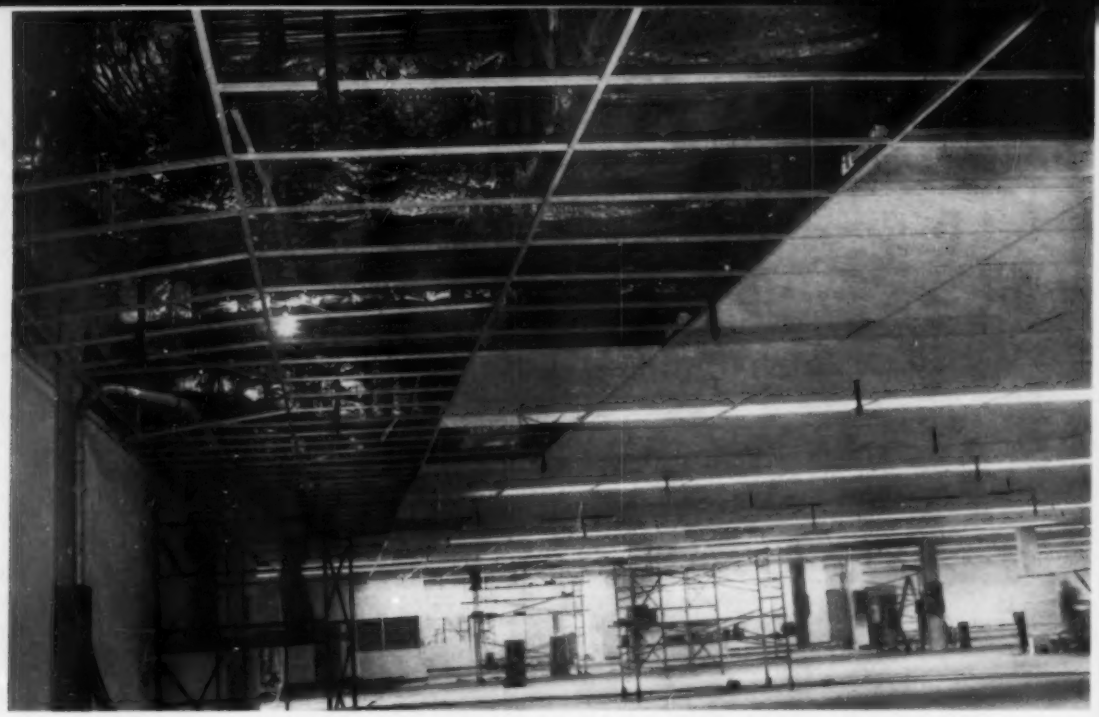


Fig. 20. Time delay circuit is based on time required to charge capacitor.



Over-all view of the assembly area shows one of the dust-proof ceiling panels in place, the insulated air ducts, and the ceiling area which acts as a return air plenum.

PLANT ENGINEERED FACILITY DISCOURAGES DUST INTRUSION

WITH AN AIM for a nearly dustless temperature and humidity controlled environment, Convair's Astronautics' plant engineering department designed a one-story, 68,400-sq ft electronics facility. The new precision components assembly building is located near San Diego, California.

Dust-gathering frills were sheared from the plant design. This helps explain why construction time-spanned but 120 days. Construction got underway on the tilt-up, 90-ft clear span, rigid-frame building on May 16, 1960. The facility was operative and in partial production by September 16, 1960.

The building's only entrances are four positive-pressured air locks and a "dust control" receiving area. Air locks are held to 0.05 psi positive pressure, their doors weather-stripped, their floors laid with easily-vacuumed asphalt tile.

Every part, big or small, received for manufacturing - assembly enters the plant's dust control room—a kind of massive, positively-pressured air lock. Here plant men, backpacking portable vacuum machines, de-dust every box during uncrating and vacuum each part. Then they heat-seal the parts in polyethylene dustproof bags before they are routed to adjacent stock racks or dispatched directly to the manufacturing-assembly area. Big components such as castings get the vacuum de-dusting treatment, then are sealed in press-fit lidded, plastic tote bins.

One interesting plant feature is the location of a first aid room immediately adjacent to one of the four entrance air locks. The aid station's unique locale permits it to receive patients either from within or outside the plant—without breaking the environmental isolation within the plant.

A single minimum - maintenance 262-ton absorption refrigeration unit holds in-plant air between 72 and 76 F. Seven air handling units effect an air change every eight minutes while using 90 per cent return air. Even more rigid control applies to two critical manufacturing areas involving plating and circuit printing.

High-Temperature Hot Water

The plant's air conditioning and heating system operates not on steam but rather on high-temperature hot water (maximum 385 F, 400 psig) from Astronautics' existing central boiler plant which supplies other

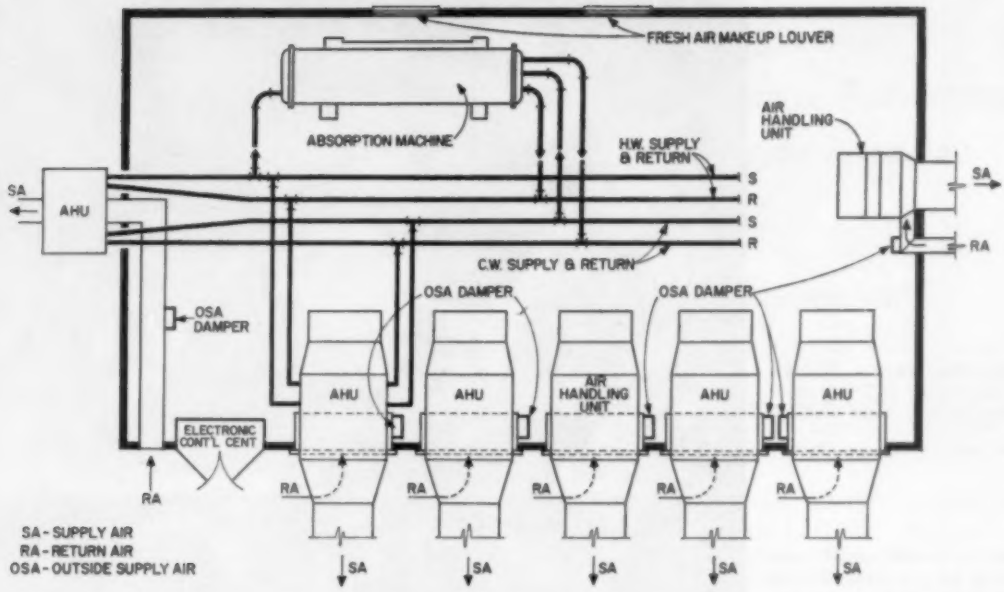


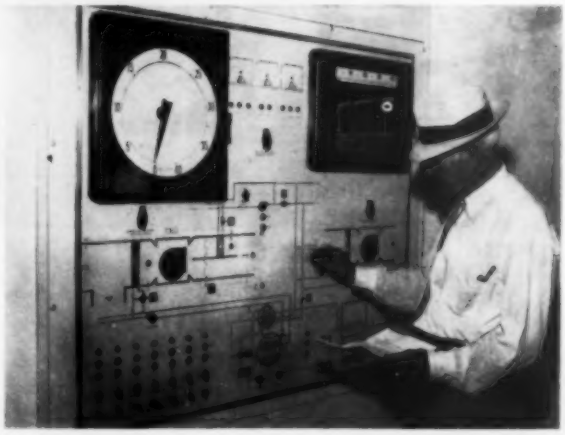
Diagram shows general arangement of air handling units in the equipment room, as well as the air supply and return lines, which help maintain air between 72 and 76 F.

buildings in the facilities' complex. The new precision assembly building is, however, the first at Astronautics to make use of hot water both for heating and air conditioning.

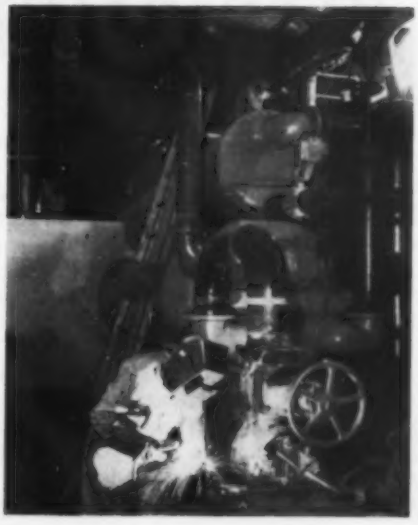
A suspended acoustical tile ceiling 10 ft high, incorporating four-way diffusers, helps enclose a plant-dimensioned plenum chamber. Most of the air is recirculated through the chamber for return to the zonal units. Three roof-top ventilating fans assure that at least 10 per cent of the return air is exhausted.

For seven of the plant's nine zones, air is routed through the equipment room in which the absorption-refrigeration unit is located. The unit uses some 84 gpm of high temperature water (240-385 F); it operates with condensing water at 87 F, chilled water 40 F. The high temperature water is used as a heat source in the generator.

Air processed in the equipment room goes through 5-micron, 85 per cent efficiency filters. On the other hand, air supplied through the two zonal units in the supercritical plating room undergoes two-stage cleaning with secondary filtration of 99.97 per cent efficiency for 3 microns. **End**



The central, graphic panel outside the utility room monitors visually and electronically the entire air conditioning system.



In-construction photo shows the single 262-ton absorption refrigeration unit being installed. Unit operates on high-temperature hot water instead of steam (max. 385 F, 400 psig).

Here, operator uses a balloon to plug or "mask off" the open end of an air duct tube section.

Tube sections and small canopies are protected during spray painting. When paint has dried, balloons are punctured.

TOY BALLOONS KEEP PAINT OUT!

QUITE OFTEN during maintenance spray painting, either in the paint shop or out in the plant, it becomes necessary to mask large openings so that overspray paint will not contaminate an interior. This is usually quite a time-consuming job if standard procedure is to use conventional masking tape, cardboard cutouts, etc.

To simplify this masking job, any maintenance painter can borrow the production techniques employed at the Long Beach, California Division of Douglas Aircraft Company in painting duct work for the huge DC-8 airplane. Here, as shown in the accompanying photographs, toy rubber balloons are used to plug such openings. The balloon is merely inserted in the opening, inflated, then punctured with a pencil point after painting has been accomplished.

The same technique is employed for "masking" openings in large castings and other sub-assemblies where paint must be excluded from the interior. The balloon will expand to fill an opening of practically any shape.

While a restricted air flow nozzle attached to a regular air line is used for inflation during steady production work, good old "lung power" will suffice for the occasional job. After the balloon is inflated, the pigtail is given a couple of twists, then sealed down with a piece of masking tape.

Using the balloons in steady production work on the DC-8 ducting has cut masking time 90 per cent. Cost of the balloons is from $5 to $10 per gross, dependent upon size. **End**

MEASURING INDUSTRY'S HOT SPOTS

By E. F. UPTON, Jr., Chief Engineer
Daystrom Inc., Weston Instruments Div., Poughkeepsie, New York

PART 1

Thermocouples, Potentiometers, and Radiation Pyrometers

A Primer On Temperature Measurement

TEMPERATURE MEASURING devices have been developed in a wide variety to meet the many requirements of industry. Economics, accuracy, temperature range, and convenience are the principal factors dictating the variety of measuring and control devices available.

In spite of the many physical forms temperature measuring and control equipment has taken, there are relatively few basic physical phenomena involved. There are some five basic phenomena which form the basis for most temperature measuring instruments. These are:

1. Thermoelectric effect
2. Changes in electrical resistance
3. Radiant energy
4. Change in physical dimension or characteristics of liquids, metals, and gases
5. Differential expansion of metals

The thermoelectric effect or conversion of heat energy to electrical energy was discovered 140 years ago in 1821 by Seebeck. This effect has been used for temperature measurement for many years. Most commonly, the thermoelectric effect in metals has been used for this purpose. Currently, there is interest in the fact that the effect is reversible. Thermoelectric junctions can be heated or cooled by electric currents. We may witness thermoelectric power generation and refrigeration on a commercial scale in our lifetime.

Changes in electric resistance of metal conductors is even older as a known temperature measuring system. Platinum resistance thermometers are a convenient secondary standard of temperature. In the last decade or so, increasing interest has been shown in semiconductors for temperature measurement.

Please Turn Page

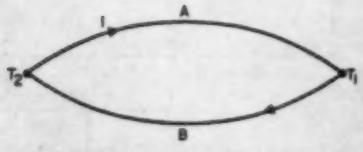


Fig. 1. Current will flow in a circuit consisting of two metals if the junctions are at different temperatures.

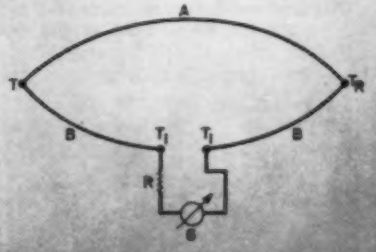


Fig. 2. Using a millivoltmeter to measure voltage of a thermocouple.

TEMPERATURE SENSORS USUAL TEMPERATURE RANGES

Thermocouples	−300 to +3100 F
Filled System	
Thermometers	−300 to +1000 F
Resistance	
Thermometers	−300 to +1000 F
Radiation	
Pyrometers	up to 4000 F+

Table I. Temperature ranges of common industrial measuring devices.

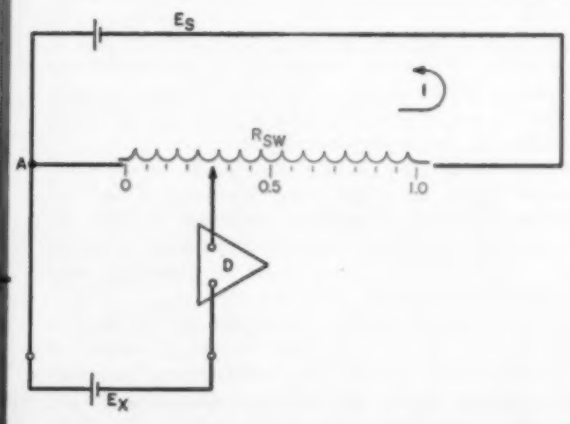


Fig. 3. Potentiometers measure with precision by comparing the voltage to be measured with a known voltage.

THERMOCOUPLE TYPE	WIRE SIZES (AWG)				
	8 (0.128 in.)	14 (0.064 in.)	20 (0.032 in.)	24 (0.020 in.)	28 (0.013 in.)
Copper-Constantan	-	700 F	500 F	400 F	400 F
Iron-Constantan	1400 F	1100 F	900 F	700 F	700 F
Chromel-Constantan	1600 F	1200 F	1000 F	800 F	800 F
Chromel-Alumel	2300 F	2000 F	1800 F	1600 F	1600 F
Platinum Rhodium-Platinum	-	-	-	2700 F	-

Table II. Recommended temperature limits for various AWG wire sizes.

MEASURING INDUSTRY'S HOT SPOTS

Measuring the radiant energy from a heated body is useful over a wider range of temperatures than any other method. Many special purpose devices using various parts of the spectrum from the infrared on through the visible spectrum have been designed. Some measure the amount, some the wave length of radiation, some a combination of both.

Physical expansion of liquid, gas and solid materials has been used in such varied devices as filled system thermometers, liquid-in-glass thermometers and many others. Differential expansion of metals has been used in bimetallic devices of many kinds. The usual temperature ranges for which four industrial types are used is shown in Table I.

Use of the thermoelectric principle is limited only by the ability to find materials with appreciable output voltage which are stable and reproducible. Filled system thermometers are range limited by such factors as the critical temperature of liquids—they refuse to stay liquid above this temperature, freezing point of liquids, and the fact that metals lose their ability to contain gaseous materials at high temperature.

An electric current will flow in a closed circuit consisting of two metals if the two junctions are at different temperatures, Fig. 1 A and B are the two different metals; T_1 and T_2 are the temperatures of the two junctions. The current, I, will flow in the direction shown by the arrows if T_2 is above T_1 and A is thermoelectrically positive to B.

Magnitude of the voltage which causes current flow is characteristic of the two metals and a function of the temperature difference, $T_2 - T_1$. If T_1 is known, temperature T_2 can be determined for a given pair of metals by measuring the voltage developed.

Recommended upper temperature limits for all thermocouple types currently being standardized by the American Standards Association are shown in Table II. Recommendations are of necessity general in nature as actual installation conditions, type of protection, and atmospheres may modify these greatly.

The circuit shown in Fig. 2 illustrates the use of a so-called millivoltmeter to measure the voltage output of the thermocouple. Actually, the millivoltmeter is a current measuring device, not a voltage measuring device. The voltage is determined by measuring the current in

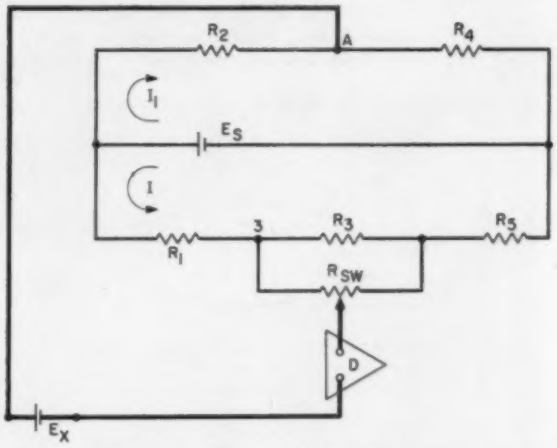


Fig. 4. Circuit used in many industrial potentiometers. Resistors R1, R2, R3, R4, and R5 extend range of meter.

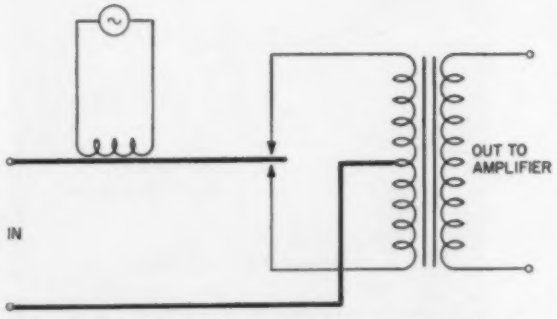


Fig. 5. This vibrator circuit changes thermocouple direct current to alternating current to permit amplification.

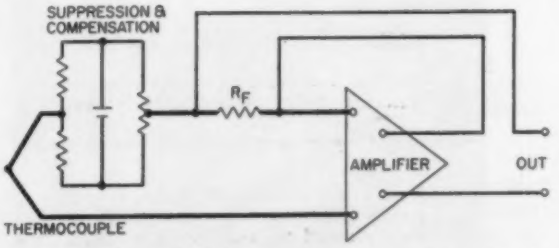


Fig. 6. Transmitting device converts thermocouple signals to standard electrical signals used in some controls.

a circuit of known resistance R. These are interrelated by Ohm's law

Voltage = Current × Resistance

This is why millivoltmeters are generally calibrated for a certain thermocouple resistance. Manufacturers strive for the highest internal resistance of the instrument consistent with ruggedness. A high internal resistance makes changes in external resistance smaller by comparison.

Output of a thermocouple is a function of the difference in temperature, $T - T_R$, in Fig. 4. If T is to be measured, T_R must be known or its effect compensated.

A suitable method of compensating a millivoltmeter for T_R suggests itself if we note that the output of a thermocouple is zero if both ends are at the same temperature. Our compensation must, therefore, shift the zero of the instrument such that it reads the temperature, T_R, whenever there is no input to the instrument. This is conveniently done with a bimetal strip attached to one return spring of the moving element.

One further refinement used, if good accuracy is desired, is to compensate for changes in resistance of the copper coil of the galvanometer with temperature. This is usually done with a negative temperature coefficient resistor (thermistor) whose resistance change with temperature is in the reverse direction from that of the copper of the galvanometer.

Whenever greater precision, availability of recording feature, or sophistication of control required dictate a choice other than a millivoltmeter, potentiometers have proven very useful. The potentiometer is a comparison device. It measures by comparing the voltage to be measured with a known voltage. Note that it measures voltage—not current. Important application advantages stem from this.

A basic potentiometer circuit is shown in Fig. 3. The voltage, E_s, is a known voltage capable of supplying a current, I, through the slidewire, R_{sw}. The voltage, E_x, is the unknown being measured.

The sliding contact of R_{sw} is positioned until the detector, D, indicates no current flows through E_x. When this is done the voltage drop due to the current, I, between point A and the sliding contact of R_{sw} is equal to the unknown E_x. By attaching a pointer to the contact of R_{sw}, the instrument will indicate directly on a scale.

This basic circuit illustrates the principle but is not flexible enough for general use. The circuit used in many industrial instruments is shown in Fig. 4. Resistors R_1, R_2, R_3, R_4, R_5 provide flexibility in choosing range. Compensation for thermocouple reference junction temperature changes is provided by making part or all of R_2 of copper. This shifts the electrical zero of the circuit to permit direct reading of temperature of the thermocouple hot junction.

It has been noted that the voltage, E_s, must be known. Its accuracy and the accuracy of the various resistors determine the accuracy of the method. If conventional batteries are used for E_s, provision must be made for periodically checking this voltage against a standard. Development of semiconductors known as Zener diodes has made it possible to provide precise, stable, long life power supplies which are rapidly supplanting batteries.

Detector, D, is characteristically a high gain amplifier capable of powering a servomotor for repositioning the slidewire. This motor can also position pointers, recording devices, and controls. For simplicity in design most such amplifiers are a-c amplifiers. Since the thermocouple is a d-c device, the d-c unbalances in the potentiometer circuit are converted to a-c with a circuit such as that in Fig. 5.

A source of a-c power causes the reed of the contacting device to vibrate at power frequency. Assume the upper terminal of the input is positive. If the upper contact is closed, current will flow through the contact and *down* through the upper half of the transformer winding. When the lower contact is closed, current flows *up* through the lower half of the transformer winding. An a-c current of power frequency is induced in the secondary of the transformer.

Tracing currents will show that reversing the polarity of the input reverses the phase of the a-c voltage in the transformer secondary. This a-c voltage can now be amplified and used to operate a reversible a-c motor to drive the system.

Accuracy of industrial potentiometers is about plus or minus 0.1 to 0.5 per cent, depending on cost and manner of specification. Power available from the servomotor permits great variety in speed and type of recording and control. Multiple point, single point, recording, indicating, controlling instruments are all available. Speeds from 60 seconds for full scale traverse to ½ second and less are available.

A circuit principle of a somewhat different type of po-

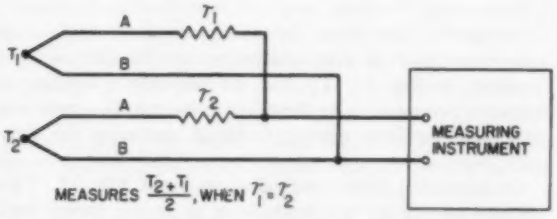


Fig. 7. Method used for measuring the average of two temperatures using thermocouples connected in parallel.

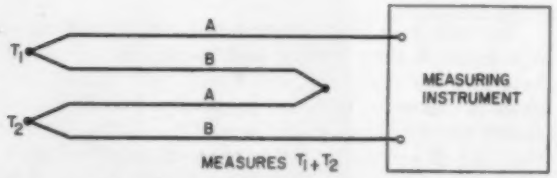


Fig. 8. Alternate method employs thermocouples connected in series to measure the sum of all temperatures.

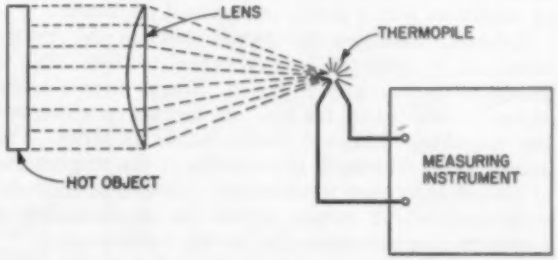


Fig. 9. Industrial radiation pyrometers measure total energy that can be collected by a calibrated receiver.

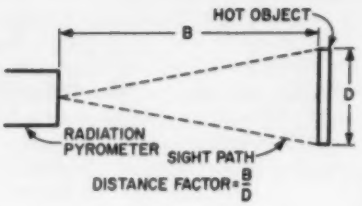


Fig. 10. Factor of 20 to 1 means maximum distance from object to pyrometer can be 20 times object size.

tentiometer is shown in Fig. 6. This is a transmitting device for converting thermocouple signals to standard electric signals used in some control systems. A high gain amplifier detects any unbalance between the thermocouple and the suppression bridge. The bridge is not rebalanced in this arrangement. Instead the output of the amplifier is applied in series with the input through R_F to rebalance the circuit. This arrangement is not theoretically a null-balance arrangement, but if the amplifier has sufficient gain, it begins to approximate a balanced circuit from a practical viewpoint.

There are two methods available for measuring the average of two or more temperatures using thermocouples.

In Fig. 7 the thermocouples are connected in parallel. There may be as many as desired with the requirement that the resistance of each of the individual circuits be the same. This is usually handled by inserting large resistances, all equal, in series with each thermocouple to swamp out the effect of resistance of thermocouple resistances.

In this method the instrument calibration is not special. It is identical with the calibration of an instrument for use with a single thermocouple. Thermocouples can be added or subtracted without changing the instrument.

An alternate arrangement is shown in Fig. 8. The thermocouples are connected in series. This arrangement actually measures the sum of all the temperatures. Scale calibration takes care of the division by the proper number. The advantage of this method lies in the fact that no swamping resistors or balancing methods are necessary.

It has a major disadvantage, however, in that instrument range is special. Changing from two to three thermocouples requires recalibration of the instrument.

Radiation pyrometers make use of the fact that radiant energy is constantly being emitted by everything. The amount of this energy depends on its absolute temperature and the emissivity of the material. Optical pyrometers measure the radiant energy by optical comparison of brightness with a source of standard brightness.

Industrial radiation pyrometers measure the energy which can be collected by a calibrated receiver. This is illustrated in principle in Fig. 9. Energy from the hot object is collected by the lens and focused on a thermopile consisting of several thermocouples in series. The output of the thermopile is a function of the temperature of the hot object and its emissivity. Output of these devices is usually a voltage which has approximately a fourth to fifth power relation to the temperature.

If certain aspects are duly considered, radiation pyrometers can be extremely useful—many times permitting

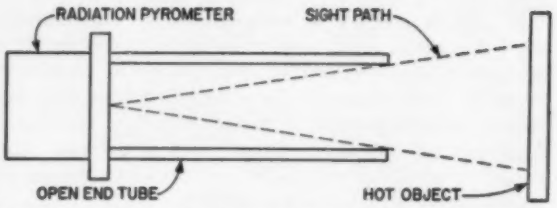


Fig. 11. Positive air pressure through sight tube keeps end clear of smoke to increase sensitivity of pyrometer.

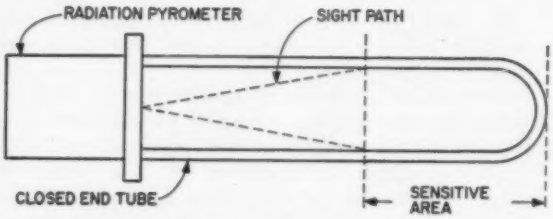


Fig. 12. Closed end pyrometer tubes are used for measuring temperatures below the surface of molten metal.

temperature measurement in otherwise impossible circumstances. Size of the hot object being measured must be sufficient to cover the field of view of the radiation device. A ratio, known as the distance factor, affords a convenient way to estimate this. Referring to Fig. 10, if the device has a distance factor of 20:1, it means that the maximum distance from object to pyrometer can be 20 times the size of the object.

Conversely, nothing may be permitted to obstruct a clear view of the object being measured. A typical arrangement used to keep smoke out of the field of view is shown in Fig. 11. Positive air pressure is applied to keep the open end tube clear. In this case, the open end tube must be large enough to avoid obscuring the sight path.

Occasionally, closed end tubes are used, Fig. 12. This permits measuring temperature of a molten metal bath below the surface. As is obvious, the sensitive area is all portions of the tube appearing in the sight path. The entire sensitive area must be exposed to the temperature being measured.

Particularly at lower temperatures emissivity becomes a problem. A shiny surface, such as polished metal, may have very low emissivity, and it may vary. Where emissivity is unknown, radiation pyrometers cannot be calibrated devices but may still be useful as comparison devices for detecting changes in temperature. Fortunately many industrial applications are such that the emissivity is high and relatively constant. **End, PART I**

The 1960 clinic on industrial lighting was well attended. Plan now to be part of this group November 16, to keep up to date.

PLAN NOW TO ATTEND THE SECOND ANNUAL PLANT ENGINEERING CONFERENCE ON INDUSTRIAL LIGHTING

DESIGNED to help plant engineers keep up-to-date on new equipment and techniques, a second all-day conference on Industrial Lighting has been planned for November 16, 1961. Theme of the conference, co-sponsored by PLANT ENGINEERING and The Chicago Lighting Institute, will emphasize planning, design and maintenance. Scheduled to start at 9:00 a.m., at the Chicago Lighting Institute, 140 South Dearborn Street, Chicago, Illinois, the clinic will feature a full day of informative talks and demonstrations.

Chairman of the morning sessions, Ole A. Hill, Jr., President of the Chicago Lighting Institute, will welcome all guests and introduce the morning speakers. First speaker, Benjamin S. Benson, Jr., Benjamin Division, Thomas Industries, will outline recommended illumination levels in industry according to Illuminating Engineering Society standards with emphasis on the kind of tasks you are working with every day.

Robert L. Allen, Region Engineer, Westinghouse Electric Corporation, will discuss filament, mercury and fluorescent light sources used in industry followed by Wallace W. Weld, Chief Application Engineer, Revere Electric Manufacturing Company, covering the problems of lighting outdoor industrial property. This will include parking lots, storage yards and lighting buildings for protection.

Answers to the problems of lighting both high and low bay industrial areas will be covered by Albert W. Lange, District Engineer, Holophane Company, Inc. The last speaker in the morning session will be Lawrence Creech, President, Lease-Lite Corporation, San Francisco, California, talking on getting the light you are paying for. Mr. Creech will also demonstrate a special machine he has developed to reduce labor required to keep equipment clean.

Chairman of the afternoon sessions will be Arthur L. Rice, Jr., President, Technical Publishing Company, Barrington, Illinois. Mr. Rice is well known in industry as publisher of both PLANT ENGINEERING and *Power Engineering*.

Tips on making lighting layouts will be presented by Willard Allphin, Illumination Research, Sylvania Electric Products, Inc., Salem, Massachusetts. Mr. Allphin is the author of the series of articles, "How To Plan Industrial Lighting", in the Sept., Oct., Nov., and Dec., 1960 issues of PLANT ENGINEERING.

Lighting for use in hazardous locations will be covered by O. A. Cavanagh, Service Engineer, Underwriters Laboratories. You will learn how and where to use this special equipment. Combining lighting, cooling and heating from the same ceiling unit will be discussed by J. M. Johnsen, Multi-Vent Sales, Pyle-National Co.

James R. Chambers, Appleton Electric Company and President of the Illuminating Engineering Society will tell us why good industrial lighting makes common sense. These are the arguments you will need to put across good lighting in your plant. The last item on the program will be an "Open End" discussion moderated by Vern Kempf, Electrical Editor, PLANT ENGINEERING. **End**

Featured at last year's clinic, Herman E. Sereika, of the Commonwealth Edison Company, demonstrates how contrast affects ability to see easily.

Plan Now To Attend

November 16, 1961 at 9:00 a.m.
140 S. Dearborn Street, Chicago, Ill.
Registration Fee $5.00

For additional information write to: Editor, PLANT ENGINEERING, 308 East James St., Barrington, Illinois, or call Vern Kempf, Electrical Editor, Dunkirk 1-1840 (Barrington) Area code 312

CONTAINERIZATION METHODS IN BULK MATERIAL HANDLING

To help you determine if such a system fits your needs, the author analyzes application, economics, equipment selection and operation

By **CARL D. ACKERMAN**, Tote System, Inc., Beatrice, Nebraska

WHAT is containerization? It is the art and science of the design and application of the proper container to adequately protect a given material and to facilitate the handling of the material in unit loads at least possible cost.

A container may be thought of as an enclosed pallet incorporating necessary filling and discharge openings to facilitate the movement of bulk material between manufacturing, storage, transit and use point. Bulk material handling containers are usually limited in size so that when fully loaded they can be handled easily by conventional lift trucks.

Discussion in this article will be limited primarily to units adaptable for bulk handling of dry materials such as chemicals, plastics, and various food products. This type of container lends itself to two general types of operations—inter-plant shipment by truck, rail or barge and in-plant handling.

All metal containers are equipped with a pallet bottom usually consisting of four corner legs, the dimensions of which have been standardized at 42 in. wide by 48 in. deep. These dimensions permit placing the containers two wide in a highway trailer, across the 42 in. dimension and also permit placing the containers two wide on a railroad car across the 48 in. dimension. Clearances underneath the containers have been standardized at 4½ in. to permit easy access of all conventional fork trucks, either of the rider type or the walkie type. All manufacturers have special legs available if these underclearances have to be increased to meet a specific problem. A popular container has been the aluminum container made of a high strength alloy.

Where corrosion is no problem, ordinary carbon steel containers are also used. There are some materials with which neither carbon steel nor aluminum are compatible, in which cases, stainless steel, monel or magnesium containers are used.

Types of Containers

Containers are filled through a top opening available in several sizes and types to suit the particular needs of the user. Most of these top openings are equipped with a sealed cover so that once the material is placed in the container it is protected from the weather and the container can be stored indoors or out, and can be transported on open highway or railroad equipment without damage to the bulk material inside.

A recent development in metal containers embodies a cone top through which material may be placed in the bin, and then to discharge the material the unit is turned upside down.

There are also many types of wire basket containers—designed primarily for handling castings and forgings—but which have been used experimentally to handle dry bulk material utilizing various types of plastic lining.

At the present time there is only one rubber container being offered. This type of container has the advantage of being collapsible so that it can be rolled up into a smaller package for return shipment to the supplier after it has been emptied. Some of these rubber containers are quite large and often necessitate special handling facilities at both the supplier's and the user's plant.

They appear to be ideal containers for water transportation, where turnaround is slow and the user or supplier has to pay for the cube of the container both going and coming. They also can be handled on highway trailers or specially-equipped railroad gondola cars.

Cardboard containers are available in many sizes, usually limited to a total load capacity of 1000 or 2000 lb. At the present time, a great number of these cardboard unit containers, which incorporate a pallet bottom and can be sealed by means of spe-

Courtesy Container Corporation of America

Cardboard containers, with built-in pallet bottoms, are being used at this plant to handle their bulk materials.

cial tapes, are being used as expendable containers for one trip use only. In this type of operation they do not eliminate the container cost but present in-plant savings to both user and supplier in handling a unit load instead of 50-lb or 100-lb bags.

Containers are good for fast, economical and safe movement of bulk materials from the producer to the processor. They can be handled quickly and easily, thereby speeding up operations from filling to discharging. They also protect product quality and insure product uniformity.

Containers are used in numerous installations for temporary storage while materials are being laboratory tested. After tests are completed, blending of different batches is accomplished by means of two or more discharge stations equipped, as the case may be, with variable speed drives, emptying into a central conveyor or receiving hopper, which in turn feeds into a package line. If blending has to be done by weight, these stations can be mounted on subtract-scale platforms or they can feed directly into a weighthopper, which in turn will empty into the process or packaging line.

Blending Stations

In some installations, as many as 12 different materials are being discharged by weight into a final blender. Multiple stations can be mounted on separate weighing platforms, or individual stations can be mounted on independent weighing platforms. This type of automation eliminates hand weighing operations and provides blending accuracy. It also prevents loss of product through dusting and sifting when material is weighed by hand.

Containers can also provide a "bridge" between production and packaging departments, when two departments operate on different hours, containers insure product protection. In many installations, the production facilities run 24 hours a day, while final packaging activity often runs only eight hours a day due to the higher speed of packaging lines.

Filling Operation

The first operation involved in the use of a container system is filling the bin. A number of different types of equipment and techniques are used in this operation. Where it is desired to pack a lightweight aerated product, automatic packing equipment can be used, consisting of a jolting mechanism underneath the bin and a spinner unit that lowers inside it.

Material flows down the spinning feed spout onto a rapidly revolving disc which throws the product to the sidewalls of the bin, eliminating the angle of repose in the top corners. The spinner unit is designed so that exhaust air from the bin is returned into a filter bag or air collecting system. Where both a jolter and spinner device are used, automatic relays usually are incorporated into the control panel to shut down the system when the bin is completely filled.

A jolting device raises the container about ½ in. and drops it against fixed stops at a frequency of approximately 28 rpm. This type of equipment adds approximately 15 per cent to the capacity of the bin and is particularly desirable where lightweight products are being used.

In many cases the extra payload is not critical and a simpler spouting technique can be employed. In this type of operation, material flows down the spout by gravity to fill a bin. Frequently, a Y spout is used on a two-bin filling station. After the first bin in the station has been filled, material is automatically diverted to the second, while an operator is removing the first bin and replacing it with an empty. In some installations of this type, bins are being filled at a rate of 25 per hour—the equivalent of a carload of material an hour.

Where it is not practicable to fill the bins at a rapid rate by gravity flow, another technique can be used which eliminates the need for an operator to stand by during filling. In this type of operation a distribution screw conveyor is located over the top of a line of bins. After the first container in line is filled, the conveyor automatically carries material to the second, and so on down the line. Periodically, the operator removes the loaded containers and replaces them with empties, keeping the handling man-hours low, comparable to a fixed

This metal container is being filled with salicylic acid. Airtight seal keeps acid safe from contamination.

storage bin installation. With this multiple-container filling arrangement, various types of dusttight connections between the filling conveyor and the container, including the necessary filters, are available.

Until a few years ago no economical method of rail transportation for containers was available, and for that reason very few bulk containers were in service. The freight cost on the empty bin return made the operation uneconomical. This prompted the development of the container car.

One type of railroad movement for bulk material involving containers might be referred to as a combination system. This system employes a simple gravity discharge covered hopper railroad car, (which is furnished free by the railroads), and equipment for unloading the car and filling containers for storage and distribution to the in-plant use points.

Containerization Economics

Since the economics of a container operation are determined by turnaround, water transportation is not customarily used. However, when containers are shipped by barge, lifting lugs frequently are added to the top of the containers to permit ease in sling handling.

Containers can be shipped easily on standard truck equipment, either flatbed or van trailers. An ordinary piece of highway equipment is converted quickly and easily to a bulk trailer without the necessity of special single trailer units. Up to 16 bins can be carried on a 34-ft trailer, but normally 8 to 12 loaded bins are all that can be handled, due to state highway weight restrictions. In evaluating the economics of a truck movement it is often necessary to figure on round trip cost, since the empty bins may be deadheaded, as is normally the case with gasoline tank trailers.

In warehousing, the containers are handled with standard lift truck equipment. By stacking two high, a carload of material can be stored in less than 400 sq ft of warehouse storage space. This represents considerably less space than is required for storage in bags, drums, or large horizontal storage bins and is comparable to most silo storage.

Containers can be stored outside the plant, provided a paved area suitable for lift truck handling is available in the outdoor operation.

All containers are designed so that the over-all height can be easily increased by increasing the height of the sidewall sheet.

There are many cases in warehouse areas where it is advisable to obtain a container either a few inches higher or lower than standard in order to utilize all the air space available under sprinkler pipes.

Unless it is desirable to discharge material into a pile on the floor, all container systems must have available some type of discharge unit so that a sealed discharge system is available. These systems generally fall into two types—one is the gravity discharge type from the container through the station directly into a surge bin, mixer, surge hopper over a packing line or some other type of storage equipment. The gravity discharge container can also empty onto a vibratory or belt conveyor.

Another type of discharge station commonly employed is the screw conveyor type where the material is emptied into a hopper containing a screw conveyor and discharge rate is then determined by the speed of the motor drive. Using this method, it is possible to also empty into a rotary valve feeder, a pneumatic system or into the several types of disc conveyors.

If the container system has a sealed discharge station and product dust cannot escape into the manufacturing area, it becomes a simple matter to have automatic weighing.

The entire discharge station and container can be mounted on a platform scale so that all an operator has to do is set the dial head for the desired number of pounds, press the button and it will automatically discharge, weigh and shut off.

It is also possible to screw-discharge into automatic weigh hoppers, and various fully-automatic stations can be set up—even an automatic control panel using punch cards for formulation, drawing the various materials from different containers into automatic weigh hoppers for discharge into process. Containers with automatic weighing equipment such as this, offer close to the ultimate in flexible automation, since a container system is never tied down to any fixed location.

Three Important Considerations

1. Factors Affecting Selection of Equipment

When considering a container operation, if it is an inter-plant operation, the transportation economics must first be determined—whether truck or rail is most beneficial. As a rule of thumb it is always more desirable to move by truck because of a much faster turn around and, therefore, fewer containers are required for the transportation stream.

Containers can be handled quickly and easily from producer to processor by use of this 20-bin container car.

It is assumed that a containerized handling system is economical in that a subject plant has sufficient volume to make a payout attractive on the container type of handling as against paper bags, fiber drums, or other types of one-trip containers.

After determining whether rail or highway transport can be used, the next problem has to do with the size of the container. The factors that will guide you are the density of material, the size of the lift trucks available—both at the user's and the supplier's plant—and floor loads and elevator capacities if the plant is multistory. A unit load between 4000 lb and 6000 lb will generally go into almost any type of existing industrial building. Lift trucks are available to handle this size unit load. Since most metal containers have a floor area of 14 sq ft, it is an easy matter to check the floor loading in either plant.

Next to be determined is the material of construction for the container. This will depend entirely upon the characteristics of the material handled.

Doorway clearances must be available for the size container chosen as ideal for a particular application.

2. Savings in Bulk Handling

There are three principal savings involved in bulk material handling. The first is the elimination of the container cost, better known as the bulk discount, for receiving material in bulk instead of bags, fiber drums or barrels.

The next saving is achieved through reduction in labor cost. This is the labor involved in unloading the truck or car, warehousing, moving from the warehouse area to the discharge area, emptying the bags and removing the empty bags to the disposal area. The next measurable saving is the product loss saving. This concerns the material lost in a bag operation due to broken bags and the material left in bags being dumped.

In addition to the above dollar savings, warehouse space requirements are reduced.

3. Cost of Equipment

There are several possibilities involved in this volume movement. If a plant is within trucking distance of its supplier, then it can easily operate with a minimum inventory of material in the plant. The same plant, using rail transportation, should reevaluate the inventory level required in the plant at all times. On a railroad container car, empty bins should be available in the plant so that when the car comes in, immediate interchange of filled bins and empty bins could be effected.

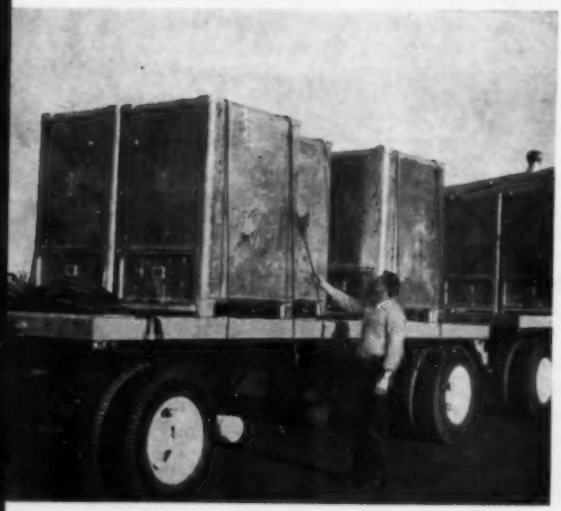
Using the same example of usage and assuming that the material will handle in ordinary covered hopper cars of the gravity discharge type, which would eliminate the need of a container car, the only extra investment is in the railroad car unloading station. Mechanical equipment which will unload a gravity discharge covered hopper car in from three to four hours, is available. In addition to the cost of the equipment is the expense of building and installing the necessary undertrack pit to carry the conveyor.

In this type of railcar-to-container operation, it still is desirable to maintain an equal inventory in the plant. It is also recommended that sufficient bins be kept on hand to take an entire carload of material.

Experience has shown that rail movements where volume is only 400,000 lb or 500,000 lb a month quite often do not meet the payout requirements set up by most companies. In such cases, check for equipment available on lease. This includes car-unloading equipment, containers, discharge equipment, motor drives, controls and scales, and other auxiliary conveying equipment. **End**

Courtesy The Goodyear Tire & Rubber Company

Flat-bed or van trucks can be converted in 15 minutes from handling dry materials to liquid hauling by this rubberized fabric tank.



Another method of transporting containers is by lashing them to flat-bed trucks for inter-plant deliveries.

QUIET, PLEASE!

Here's What Can Be Done To Silence Industry's Noisemakers

By **ALVAH C. PEASE**, Manager of Silencer Engineering
Maxim Division, J. B. Beaird Company, Inc.
Division of American Machine & Foundry Company
Shreveport, Louisiana

SUPPRESSION OF sound and its often incalculable damage to human hearing and efficiency is one of the challenges of modern life. Practically every piece of equipment associated with everyday living adds to the cacophony that surrounds us. Because of this, sound suppression is now, and has been for some time, receiving the intense scrutiny of engineers, scientists, medical authorities and industrialists.

If the noisemakers themselves cannot be operated more quietly, the solution to the problem is, of course, noise suppressors or silencers. Such silencers are built for all types of equipment—from lawnmowers to jet engines—and they range in size from those weighing less than a pound to huge units that are 10 ft in diameter and 42 ft long.

Types of Silencers

One of the more common types of silencers is the chamber silencer used on engine intakes and exhausts and on reciprocating compressor intakes when the predominant noise occurs in the lower frequencies. Essentially, the unit is composed of a two-chamber cylindrical body with a slotted inlet tube to the first chamber and a slotted outlet tube leading from the second chamber. The slots provide infinite termination and thus prevent resonance which would augment, rather than suppress, the noise. The two chambers are coupled by side tubes. Holes in the side tubes also prevent resonance.

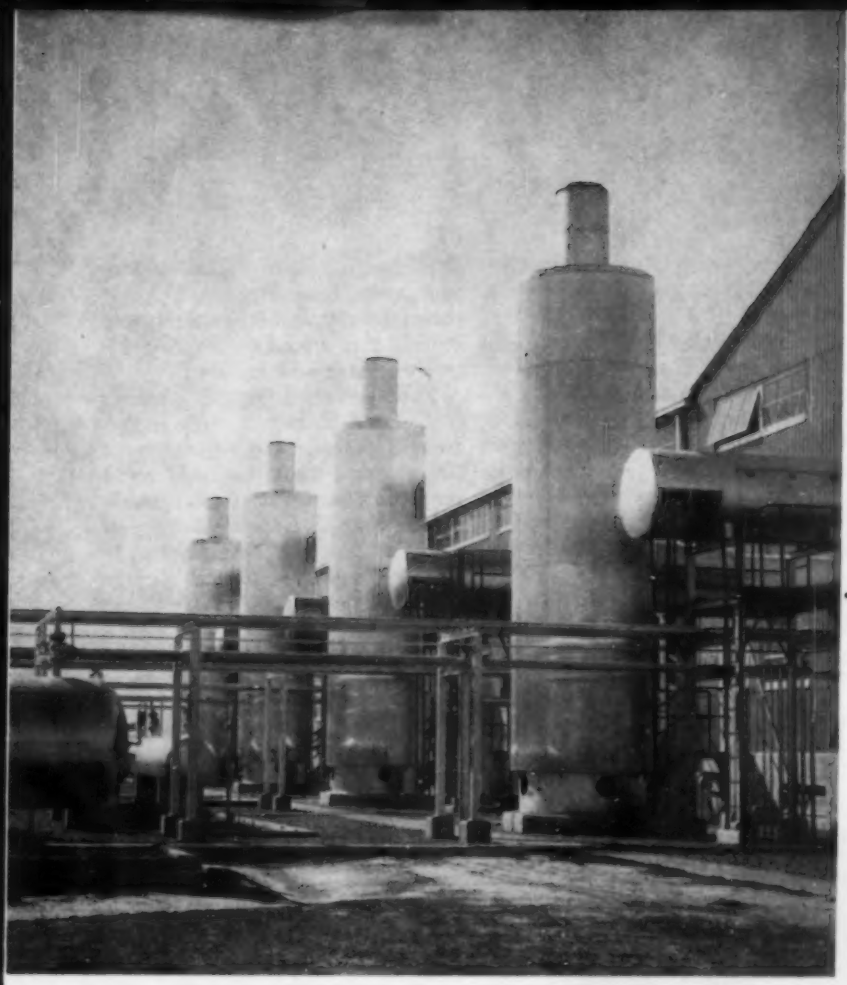
The function of the chambers is to act as a filter, or resonator side branches, to sidetrack the lower frequencies. In addition, the side tubes smooth out the pulsating nature of the flow. Reversal of flow also occurs and this is valuable in attenuating, or weakening, the higher frequencies by reflecting them back to the noise source. It is necessary to laminate the silencer shell in order to prevent shell ringing. This type of silencer design is empirical in nature since, dimensionwise, its final design has been evolved through years of practical experience.

Sometimes we design a single chamber resonator silencer that is effective on one frequency only, when this particular frequency is the only one that is objectionable. Of course, if harmonics of this frequency are present you must design additional filters to take care of these also.

Silencers to handle the noise from high velocity steam and air discharges are also available. The characteristic of this type of noise is that it usually peaks in the middle and higher frequencies. A silencer of this type has a cylindrical outer casing with a straight-through interior air or gas passageway. It is composed of a perforated steel cylindrical plate surrounded by an outside layer of acoustical packing. In the case of air, the packing usually is glass wool. For steam it is usually copper wool, as this material can take the moisture and erosion involved in a saturated steam state. Noise is reduced by the sound waves passing through the interstices of the wool, bringing about a conversion of sound energy to heat energy.

In addition, chambers are sometimes placed between the casing and the acoustical packing to attenuate the lower frequencies that are inherent in flow noise generated by a medium passing through a valve.

Another type of silencer is the spark arrestor silencer. The acoustical principles are similar to the chamber type of silencer, but a centrifugal whirling of the gas stream is accomplished by specially-designed tubes. The sparks move around the outer periphery of the flow and are trapped by a spark box on the side.



These silencers are installed on four engines at the Transcontinental Gas Pipe Line Company, Houston, Texas.

Spark arrestor silencers are mandatory in marine application and in some oil field applications where there is a danger of fire. For small boats, a water-cooled silencer is employed. In this silencer, water is dumped into the exhaust, upstream of the silencer, thereby quenching any hot carbon particles and keeping the exhaust line cool during engine operation.

Diesel engine silencers are available in pipe sizes from 4 in. to over 40 in. Different engines have different limitations and allowable back pressure can vary anywhere from 2 in. of water up to 20 in. of water and sometimes higher.

However, although sound reduction can be effectively accomplished with silencers, that reduction must be accomplished without impeding the gas flow beyond certain limitations. If it weren't for this restriction, silencing would be easy. All you would have to do would be to put the perfect silencer on the line—a cork.

Biggest task in the sound suppression field is in quieting jet engines. This monster is a mammoth noise creator and engine crews have been sickened from being exposed to their incessant violent vibrations.

A good share of the publicity in silencing these engines has been concerned with the in-flight suppressor. Boeing 707 and Douglas DC-8 aircraft are using in-flight suppressors that are providing sound reductions of about 4 to 5 decibels. This much is helpful, but a few more decibels would be a far happier answer.

The problem is not that the sound cannot be suppressed, but rather that it takes weight to do it. Every pound added to a plane is expensive. For this reason, the in-flight silencer is still a compromise, although it does assist in decreasing the noise. The advent of the turbo-fan engine, with its lower noise level, is another step in the right direction.

Ground Jet Silencers

However, when it comes to ground jet silencers, vast strides have been made. Let us consider what noises are created by a jet engine. At the front of the engine is the compressor with its multiblades. A high-pitched shriek comes out of the intake. This is the sound that is so annoying when the plane taxies up to the terminal. Downstream of this is the combustion chamber from which comes the lower frequency roars characteristic of combustion processes. Then follows the turbine noise, again high frequency in nature.

One more noise source can be the afterburner, terrific blast that feels as though it could shake you to jelly. Last, but not least, is the noise created by the jet stream as it passes through atmosphere downstream of the engine. Strangely enough, it is this shearing action, cutting through air with its violent eddies and swirls, that produces most of the noise.

One of the biggest headaches facing

About the Author

Alvah C. Pease graduated from Tufts University, Boston, Massachusetts, with a degree in mechanical engineering. He did postgraduate work at Hartford University, Hartford, Conn. Most of his career has been as a design engineer. He participated in the initial design of silencing equipment for jet engines and is considered one of the top authorities on silencer design in the United States.

us was that the aircraft companies would buy silencers, but they didn't want to pay a fancy price for stainless metals. Therefore, a method had to be found to utilize carbon steel material, and at the same time make it capable of handling hot exhaust gases that reach a temperature close to 3200 F. It was solved by letting the jet act as an air pump to pull cooling air in with it as the exhaust gas enters the silencer. Also, water sprays are sometimes placed in the silencers, and by a combination of water and cooling air we have the answer to the problem.

For engine test cell application, the engine must also be fed its primary air for combustion, which means that enough air must be pulled into the cell to provide both the primary and cooling air. For a large engine this meant moving up to 800 lb of air per second. So, the entrance for primary and cooling air had to be sound-treated, too.

To accomplish this, both intake and exhaust silencers are utilized. The pressure drop through the intake silencers must not be so severe that the engine will starve to death for lack of air. Also, if the reduction in air pressure inside the test cell is too great, severe stresses would be imposed on the test cell structure itself.

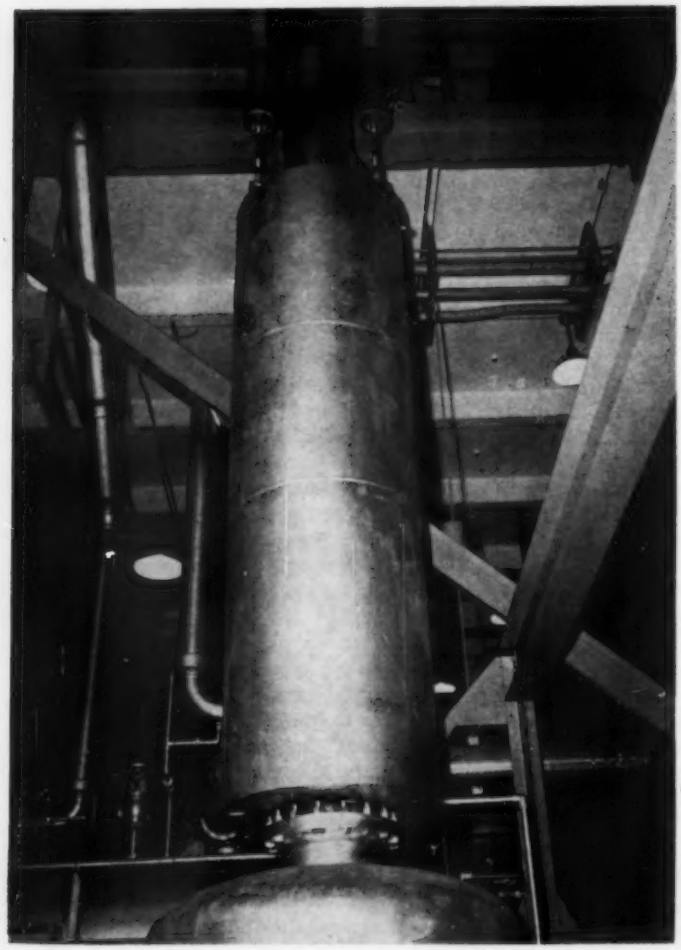
What is really needed is portable equipment that will provide adequate sound suppression of jet engine noise. At the present time, enclosing the engine in a test cell, and sound treating the cell, is the best answer. However, the cost of a test cell is extremely high. If a portable suppressor can be designed that will provide enough attenuation in near-field areas so that engine operation personnel will not suffer hearing damage, and if far-field areas have suppressed sound pressure levels within an acceptable criteria, then a good economical solution will have been achieved.

Effectiveness of portable silencers is limited. Usually a tight fit between suppressor and engine cannot be permitted since this could result in thrust measurement interference. So, there is always some leakage of sound at the point of adaptation. In addition, a certain amount of noise emanates through the engine casing to the free field, and if the residual noise from the suppressor is low enough, it will be a limiting factor in the final results.

We have made many portable suppressors, and despite the above limitations, we have been able to provide a space average attenuation of between 20 to 35 decibels depending on the frequencies involved. By space average we mean an average in all frequency bands taken in a circle around the engine at a specified distance and at equal angle intervals. It is our opinion that only by space average measurements can you determine how well the suppressor is performing. A reading taken at only one angle or location is only part of the story.

We have found that it is possible to build a portable silencer that will take the tremendous thrust and heat from the afterburner of an engine the size of a Pratt & Whitney J-75. However, the unit must be well tied down, and must possess enough strength and mass to cope with the large stresses involved in this type of operation.

Every year brings better answers to noise problems, and obviously what was good enough yesterday is no longer sufficient for today. Research is still being pursued, and we are doing our utmost to meet this critical challenge of banishing unwanted noise in modern day living. **End**



This steam discharge silencer is installed on a steam boiler blow-down service in a steam generating plant.

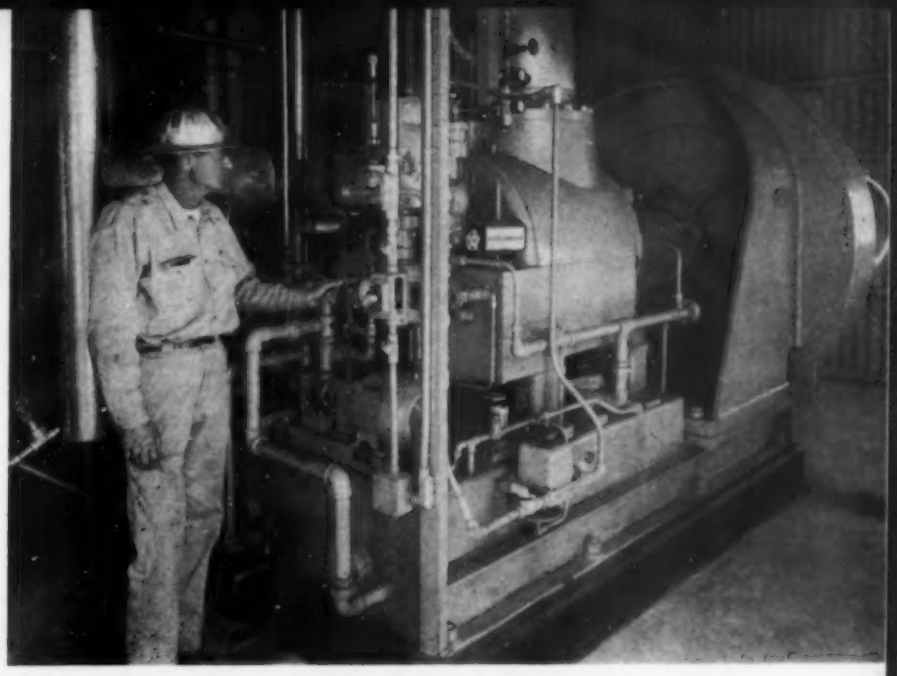


Fig. 1. In the on-base compressor lubrication system all components are mounted in a compact arrangement right on the baseplate of compressor.

For Efficient Compressor Operation . . .

SELECT LUBRICATION SYSTEM COMPONENTS WITH CARE

By J. C. SCHILDWACHTER and A. C. OSTROWSKI
Fluid Dynamics Department, Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin

BASIC CENTRIFUGAL compressor design has only three wearing parts—two load bearings and a thrust bearing. Other parts of a compressor may last a lifetime with relatively little maintenance, but bearings require continuous lubrication.

If a bearing failure occurs, extensive damage to the internal parts of the compressor can result. In effect, it can be said that the lubrication system pumps the life blood of the compressor to its bearings. Without this oil flow in proper amounts, at the correct temperature and pressure, and degree of cleanliness, the compressor bearings would fail and possibly shut down an entire process or plant.

The first consideration that should be made when writing specifications on a lubrication system is the arrangement of the equipment. Generally speaking, there are two basic lubrication systems: (1) the console (often called package); and (2) the on-base arrangement.

The console arrangement refers to the entire lubrication system assembled in a separate package for mounting, apart from the compressor baseplate.

The on-base arrangement has all the lubrication system components mounted right on the baseplate of the compressor in a compact arrangement. See Fig. 1.

With the on-base system, components of the lubrication system can be added on the baseplate without adding to the floor space requirements. Because of this, the on-base lubrication system usually has a lower installation cost.

On the other hand, the package arrangement, having its own baseplate, Fig. 2, has the advantage that it may be remotely located. Another advantage of the console is that it is a preengineered package that has been arranged in the best possible manner for most efficient functionability, ease of maintenance and accessibility.

In addition, because the components are designed in a neat package, the compressor unit is less cluttered. Often when additional components are placed on the compressor baseplate, routine maintenance of the compressor may become difficult because of possible obstructions. For greater economy and in limited space areas, the console can be engineered to supply lubricating oil to more than one compressor.

The pumps, which are the heart of the lube system, supply the lubricating oil to the compressor bearings. See Fig. 3A. To guard against possible failure of the main pump, an auxiliary oil pump should be included.

Generally both pumps may be of the positive displacement type, or both of the centrifugal type. If centrifugal pumps are used, care must be taken when establishing the pump ratings, since centrifugal pumps cannot respond to wide pressure range requirements. Be sure to specify that the centrifugal pumps should deliver sufficient oil flows upon reaching the system's maximum pressure. If this consideration were not taken into account, the bearings would conceivably be starved, even though the pumps were functioning properly.

It is also advisable to have both main or auxiliary pumps identically rated and for both to have sufficient capacity to continually maintain the system. With both pumps of identical ratings, one pump can keep the compressor in service while maintenance is performed on the other. Identical

rating of the two pumps also lends itself to interchangeability of pump parts, hence reducing spare parts requirements.

Another advantage of identical pumps is the interchangeability of operation of the two units. In many plants, it is considered good practice to alternate the operation of the two pumps so that each can operate continuously for a period of time. This way the wear on each is kept approximately equal and longer life is obtained from both pumps. An auxiliary pump will naturally get less wear during a given period of time than the main oil pump; therefore, pump reliability during an emergency is maintained by operating both pumps at regular intervals.

Safety Relief Valve

When using positive displacement pumps, a safety relief valve should be installed at the discharge of each pump to avoid the possibility of overloading the pump driver. Although a pressure control valve may also be installed in the lubrication system, the oil pump driver could conceivably be overloaded if pressure builds up in the oil supply line before it reaches the pressure control valve. Another function of the relief valve is to prevent the pump from exceeding the mechanical design pressure of the system.

In addition to the safety relief valve, both pumps should be provided with check valves in the discharge line, downstream of the safety relief valves. The check valve will prevent backflow of oil through one pump while the other pump is in operation.

When considering oil pump drives, it should be noted that two types of drive arrangements are in common use today. The main oil pump may be powered by a separate driver or it may be driven off the compressor or compressor driver shaft.

Having the main oil pump driven off the compressor, or its driver, is sometimes done when only a single power source is available. In this case, should power supply fail, the auxiliary pump will not be capable of cutting in on low oil pressure. The pump that is driven by the compressor or compressor driver will continue to turn over and supply oil as the compressor coasts to a stop. This represents the greatest advantage of the attached or shaft driven main oil pump arrangement.

On the other hand, both main and auxiliary pumps may be driven by individual drivers. This arrangement has a particular advantage in that either oil pump can be maintained without shutting the compressor down. Also, when the main oil pump is not driven from the compressor or driver shaft, it can be remotely located in a console arrangement. If the main oil pump is on the baseplate, it can be located at a convenient point which does not hinder maintenance of the compressor or the main oil pump.

The auxiliary oil pump should always be separately driven. Whether this pump's drive is motor or turbine, a constant and reliable power source must be available. When considering the auxiliary pump drive, it is advisable to use a source of power that is separate from that used to drive the main oil pump. To assure immediate pump response with a turbine drive, the turbine should always be turning over during its standby service. The motor-driven auxiliary pump has the advantage of rapid acceleration and therefore quick response to system requirements.

Next major component in the lubrication system is the lube oil cooler(s) shown in Fig. 3B. The purpose of the cooler is to maintain proper oil temperatures and thereby insure proper viscosity levels. If the oil were allowed to overheat, an oil film breakdown, because of decreased viscosity, would occur and possibly damage or destroy the bearings themselves. In writing specifications for the oil cooler, and provide the manufacturer with sufficient information to properly design the cooler, include: (1) the temperature or range of temperatures of the cooling water, (2) acidity or alkalinity of the cooling water and preferred materials of construction, (3) cooling water contaminants, such as excessive mud, silt, or other foreign material.

Oil Cooler Characteristics

With this information, a suitably designed cooler can be supplied. In particular, a fouling factor of the proper magnitude can be designed into the cooler. This factor contributes to the "on line" period of the cooler in direct relation to its magnitude. In other words the period between cleaning the cooler increases with increased fouling factor.

The cooler may be of the removable or non-removable bundle type. Either type may be easily cleaned or inspected. The removable bundle type has the advantage of allowing maintenance on the bundle at a remote location. Care should be taken when determining cooler location so that sufficient room is allowed for removing this bundle.

Careful consideration should be given in determining whether single or twin oil coolers should be specified. Twin oil coolers offer the advantage that a standby cooler is always available, should maintenance be required. This is extremely important in compressor applications requiring continuous operation over extended periods of time. On the other hand, it must be remembered that twin oil coolers are more expensive.

If the cooling water is reasonably clean, does not have any excessive acidic or basic content, and if it is

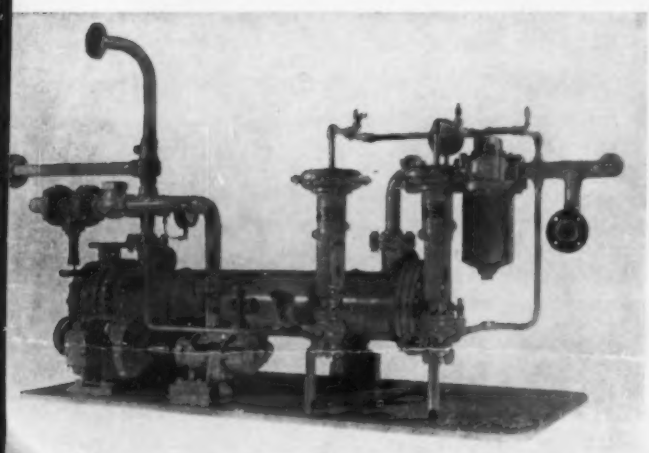


Fig. 2. For the console arrangement, the entire lubrication system is assembled in a separate unit for mounting.

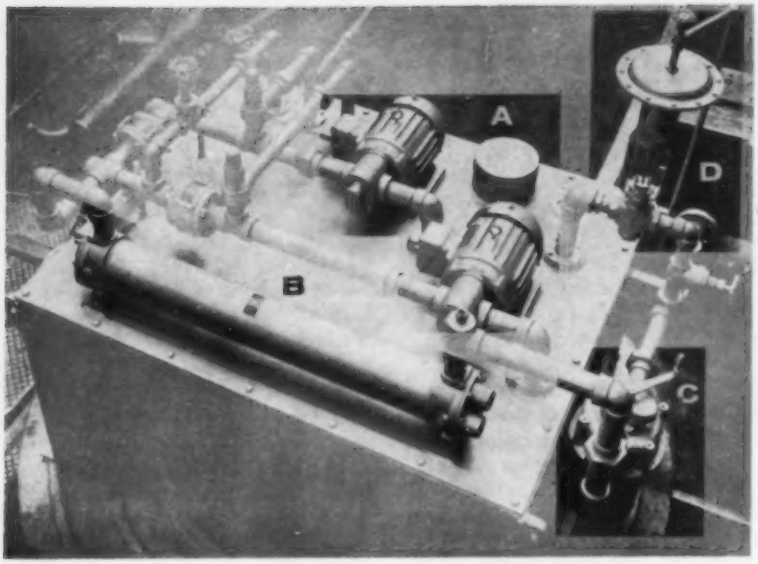


Fig. 3. Major components of a compressor lubrication system are: A. pumps, B. oil cooler, C. filter, and D. pressure control valve. These components and their arrangement are shown in a complete system for a single stage centrifugal compressor.

possible to shut down periodically to inspect and clean the cooler, there is no reason why a single cooler should not be adequate. A temperature gage may be installed in the oil line downstream from the cooler to quickly reveal if the cooler is losing its heat transfer ability. Such a warning is a sure sign that the cooler should be cleaned at the earliest possible opportunity.

If twin coolers are used, they should be furnished with a suitable changeover valve so that the oil can be directed to either one of the two coolers during operation without completely disrupting the flow of oil to the bearings. Most manufacturers will use a valve that will not completely shut off the oil flow during the transfer of oil from one cooler to the other. It is a good point to have this statement included in your specifications when ordering twin oil coolers.

Because filters prevent dirt and foreign material from entering the bearings, considerable attention should be devoted to this item, which is shown in Fig. 3C. Centrifugal compressors are high speed equipment and the slightest particle of dirt entering the bearing housings could score the bearings and eventually ruin them. To satisfy the requirements of modern compressor design, the oil filter should be capable of at least 40 micron filtration.

Another question that often comes up when engineering a lubrication system is whether single or twin filters should be used. As with the coolers, various factors must be weighed in making the choice. If properly designed, either arrangement of filters will do the job.

However, if a single filter is used, it should be stated in your specifications that the filter should be cleanable in operation. Periodically the filter should be completely cleaned during routine maintenance.

In the event twin filters are used, they should be so designed that the filter cartridges can be easily removed without disturbing other equipment. The twin filter arrangement should be furnished with a changeover valve allowing oil flow to be directed to either filter. Again, during the switching operation, oil flow to the bearings should never be interrupted, nor should any oil ever be allowed to bypass the filters.

Locating Pressure Gages

Pressure gages should be located up and down stream of the filter(s) as a quick means of being able to determine if the filter is becoming plugged. As with the temperature gage employed with the oil coolers, the pressure gages, while not essential to good operation, should be included in the lubrication system.

Pressure control valves are required to maintain a constant pressure of oil to the bearings at all times. Fig. 3D shows a pressure control valve. The system should be so arranged that the oil pressure is sensed as close to the bearings as possible. It should control the pressure by opening and closing to recycle more or less oil to the oil reservoir.

Although only one pressure control valve is commonly employed, some practice calls for individual pressure control valves for the main and auxiliary pumps. In this case, one pressure control valve is set to maintain normal operating pressure for the main oil pump and the other valve is set for a pressure slightly less than normal operating pressure during auxiliary pump operation. This arrangement is used when it is desirable that the auxiliary pump automatically cut out when the oil pressure rises to a certain pre-set level, such as placing the main oil pump back on the line.

Careful consideration should be given to the location of the oil reservoir when planning the lube system. The in-base reservoir is built into the compressor baseplate in a compact arrangement. However, because of its location in the baseplate, it is more difficult to clean and inspect and may also add to the cost of the baseplate.

The external or remote oil reservoir is almost always used when the console type lubrication system is furnished. This type lends itself to mounting of the package lubrication system on top of the tank itself or adjacent to it.

Whether the oil reservoir is in the compressor baseplate or mounted remotely, it should always be adequately baffled to prevent foaming. It may be desirable, regardless of the location of the oil reservoir, to have a sight gage installed on the side of the reservoir for a quick visual check of the oil level.

If the reservoir is to be installed outdoors, in colder climates, it is important to install oil heaters to preheat the oil before startup. Most popular are the electric immersion type or the externally mounted steam heater type. Whether steam or electric heaters are used is generally a question of preference. However, an electric heater eliminates the possibility of leaking steam and also can be more easily removed from the reservoir for

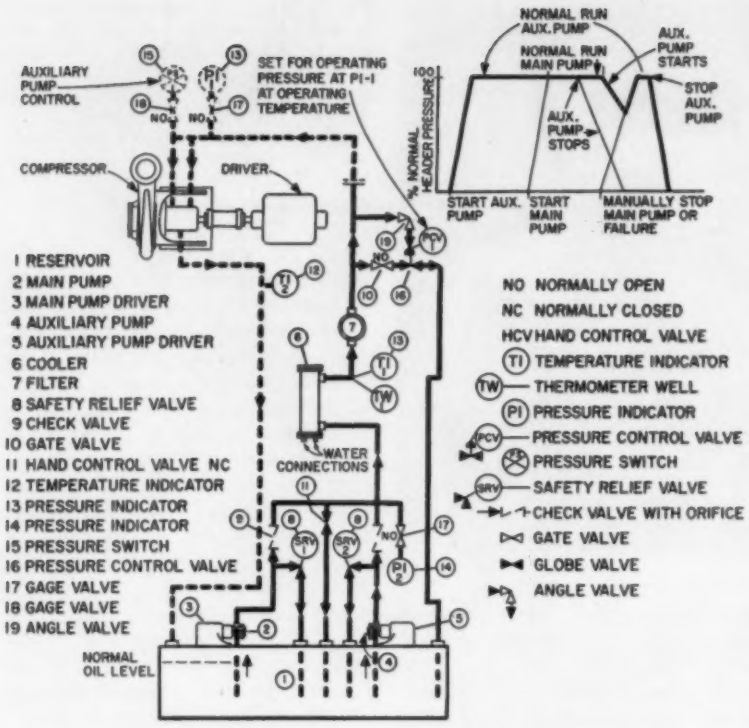


Fig. 4. Schematic shows the various components which are part of a simple but well-designed lubrication system with a pressure control valve and a main pump plus an auxiliary pump.

LUBRICATION SYSTEM COMPONENTS

inspection and maintenance than can steam heaters which are generally mounted under the tank. If electric heaters are chosen, they should not cause hot spots. Over-heating at a spot can cause oil carbonization which reduces the lubricating properties of the oil.

In addition to the major components described, other refinements may also be included in a good lubrication system design. For example, an oil pressure gage may be installed in the oil supply line just before the bearings, or just before the common oil supply header for all bearings. No matter how well designed a lubrication system is, there is always a possibility of malfunction. Therefore, these pressure gages will immediately inform the operator if sufficient oil is being supplied.

Oil pressure gages should be installed in the oil line with a valve between the gage and the main oil stream to permit removal of the pressure gage without disturbing operation of the lubrication system. Although this seems obvious, many lubrication systems in operation today do not have this important feature.

It is also important that the temperature gages be arranged so that they can be easily removed. To accomplish this, all temperature gages employed in pipes flowing full or under pressure should be inserted in separable sockets so that the gage may be easily removed without interrupting operation of the system.

All pressure and temperature gages should be of sufficient size to be easily read and they should be located where the operator need not go through any unnecessary contortions to see them.

Probably the greatest problem in the design of a lubrication system is draining the oil back to the reservoir. To guard against any difficulty here, two basic factors must be considered. They are the slope of the drain lines and drain pipe size. The drain lines should be sloped $\frac{3}{16}$ in. per foot. This is a practical value and if additional slope can be provided, it is desirable.

The drain pipe size cannot be determined without knowing the quantity of oil to be handled. However, it should be kept in mind that no compressor operator ever had trouble with lines that were oversized.

A pressure switch should also be included in every lubrication system to sense bearing oil pressure and automatically start the auxiliary oil pump when the system pressure drops below a pre-set minimum.

The first step in the normal startup of a simple but well-designed lubrication system with one pressure control valve (shown in the schematic, Fig. 4) is to energize the auxiliary pump driver. This means, if a motor is used, merely pushing a button to start the pump (items 4 and 5).

After the auxiliary is up to speed, the pressure gages at the various points in the lubrication system should be quickly checked to confirm that the auxiliary oil pump is operating properly. The main oil pump may then be started. As soon as the main oil pump is at rated speed, the auxiliary pump may be shut down. The only purpose of starting the auxiliary pump in this particular system at a normal startup is to be sure that it is operative if the main oil pump should fail to cut in.

With the main oil pump on the line, the oil should be allowed to circulate for some period of time. If there are no heaters in the lubrication system, the pump should be run long enough to let the oil temperature reach approximately 100 F before starting the compressor. Next, the compressor is started and as soon as it is on the line, cooling water flow to the oil cooler should be started to prevent the oil from overheating. Once again, a quick check of all pressure and temperature gages should be made to make certain that the system is working properly.

During a normal shutdown, the compressor drive is de-energized. As soon as it comes to rest, the main oil pump may be shut off. When this occurs, the auxiliary pump should automatically start up as soon as the bearing pressure decreases.

Operation of the auxiliary unit should continue until the temperature of the compressor bearing housings has cooled down sufficiently to allow touching by hand. The final step entails the shutting down of the auxiliary pump. **End**

FILTER MEDIA—

WHICH ONE DOES WHICH JOB BEST?

By **CHARLES SNOW**, Snow Filtration Co.
129 W. 4th St., Cincinnati 2, Ohio

NEVER BEFORE in history has technology advanced so rapidly as in the present nuclear and jet age. And the science of filtration has kept pace with other sciences in meeting the ever-changing industrial processing picture, although in truth filtration is nearly as much an art as it is a science.

The heart of any filtration system is the filter medium which is the porous substance that effects the physical separation of components of the material being filtered. This could mean the separation of solids from liquids, liquids from liquids, such as water from gasoline, or even the more difficult task of gas from gas.

In many processes the filter media which were satisfactory yesterday are not adequate to meet the more demanding conditions of today—extremes of high or low temperatures, higher pressures, more corrosive atmospheres, greater resistance to shock and finer degrees of filtration. It is in the field of filter media, rather than in the filtration system itself, that the most outstanding advancements have been accomplished.

As an indication of the extensive research and development work being done constantly by many manufacturers in the field of materials which can be used for filter media, a new nylon fiber with very high temperature resistance has recently been announced by E. I. du Pont de Nemours & Co. Featured as the "fiber of tomorrow," it is designated as HT-1. It looks like nylon, but possesses many qualities which nylon does not have. It will not melt, fuse or burn as nylon will. HT-1 withstands temperatures as high as 840 F before it carbonizes, while nylon melts at about 482 F. Even at its carbonization point, the filaments of HT-1 remain intact. It will not support combustion as cotton does. The temperature resistance and decomposition characteristics of HT-1 will offer great promise as filter media for many industrial processes.

An extremely large number of different materials are used as filter media. The general characteristics of many are given in the following. Frequently, different filter media are combined in order to achieve optimum results. Thus, metal screening is sometimes combined with paper or cloth to deliver a sufficiently fine, clear filtrate.

Requirements of a Filter Medium

Among the basic requirements of a filter medium are the following:

a. It must block passage of material to the desired degree of filtration.
b. It must permit an even flow of the slurry.
c. It must stand up under stress and pressure.
d. It must resist chemical action of both the slurry and filtrate.
e. It must resist plugging.
f. It must permit easy removal of the filter cake.

In fulfilling these requirements, the following factors should also be considered:

1. Effective filter area.
2. Pressure drop across filter.
3. Swelling effect of solvent on filter medium.
4. Compressibility of filter medium under fluid pressure.
5. Size of suspended particles.
6. Tendency of particles to flocculate.
7. Viscosity of slurry.
8. Temperature of the slurry.
9. Rate of formation of filter cake.
10. Resistance of filter cake to fluid flow.
11. Consistency of the slurry.

Paper Filter Media

Paper has much to offer in both laboratory and industrial filtration. Paper is tough and versatile. Many different types are available to meet varying requirements. It can be cut to various sizes and shapes, punched, perforated, fluted, folded or padded. It can be used with gravity, pressure, or vacuum filtration equipment. Many products are being filtered by paper, including alcoholic beverages, chem-

FILTER MEDIA—WHICH ONE?

Recommendations for filter media that may be used with different chemicals.

R — Recommend
S — Satisfactory
N — Not Recommended

	ACETATE	COTTON	DACRON	DYNEL	GLASS	NYLON	ORLON	PAPER	POLYETHYLENE	RAYON	SARAN	SILK	TEFLON	WOOL
Max. Temp. of	175	225	300	180	*	250	300	200	150	200	160	175	550	200
MINERAL ACIDS														
Aqua Regia	N	N	S	S	R	N	S	N	R	N	R	N	R	N
Hydrochloric	N	N	R	R	R	N	R	N	R	N	R	N	R	S
Hydrofluoric	N	N	S	R	N	N	S	N	R	N	R	S	R	S
Nitric	N	N	R	R	R	N	R	N	S	N	R	S	R	S
Phosphoric	N	S	R	R	R	R	S	N	R	N	R	N	R	S
Sulfuric	S	N	R	R	R	N	S	N	R	N	S	S	R	R
Chromic	N	N	R	S	R	N	R	N	R	N	S	N	R	N
ORGANIC ACIDS														
Acetic	S	R	R	R	R	S	R	R	R	R	R	R	R	S
Benzoic	N	R	R	R	R	N	R	R	R	R	R	R	R	S
Carbolic	N	R	R	R	R	N	R	R	S	R	S	N	R	S
Formic	N	R	S	R	R	S	S	R	R	R	R	R	R	S
Lactic	S	R	R	R	R	S	R	R	R	R	R	S	R	S
Oxalic	R	R	R	R	R	N	R	R	R	R	R	R	R	S
Salicylic	N	N	R	R	R	S	R	N	R	N	R	N	R	N
BASES														
Ammonium Hydroxide	S	S	N	R	S	R	N	S	R	S	N	N	R	N
Calcium Hydroxide	N	R	R	R	S	R	R	R	R	S	R	N	R	N
Potassium Hydroxide	N	R	N	R	N	R	N	R	R	S	R	N	R	N
Potassium Carbonate	N	R	S	R	N	R	S	R	R	S	R	N	R	N
Sodium Hydroxide	N	R	S	R	N	R	S	R	R	S	R	N	R	N
Sodium Carbonate	N	R	R	R	N	R	R	R	R	S	R	N	R	N
SALTS														
Calcium Chloride	S	R	R	R	S	N	R	R	R	R	R	S	R	S
Ferric Chloride	N	N	R	R	N	S	R	N	R	N	R	N	R	N
Sodium Acetate	N	R	R	R	S	S	R	R	R	R	R	S	R	S
Sodium Benzoate	R	R	R	R	S	S	R	R	R	R	R	R	R	R
Sodium Bisulfite	R	R	R	R	S	N	R	R	R	R	R	R	R	S
Sodium Bromide	S	R	R	R	N	R	R	R	R	R	R	S	R	S
Sodium Chloride	R	R	R	R	N	R	R	R	R	R	R	R	R	R
Sodium Cyanide	S	R	R	R	S	S	R	R	R	R	R	R	R	S
Sodium Nitrate	S	R	R	R	S	N	R	R	R	R	R	S	R	S
Sodium Sulfate	S	R	R	R	S	R	R	R	R	R	R	S	R	S
Sodium Sulfide	S	R	R	R	S	R	R	R	R	R	R	S	R	S
Zinc Chloride	S	S	N	R	N	N	S	S	R	S	R	S	R	N
OXIDIZING AGENTS														
Bromine	S	S	S	S	R	N	S	S	N	S	N	N	R	N
Calcium Hypochlorite	S	S	R	R	R	N	R	S	R	S	R	S	R	N
Chlorine	S	S	S	R	R	N	S	S	N	S	N	N	R	N
Fluorine	N	N	S	S	R	N	S	N	S	N	N	N	R	N
Hydrogen Peroxide	N	R	R	R	R	N	R	R	N	N	R	S	R	N
Iodine	S	R	R	R	R	N	R	R	N	R	S	R	R	N
Ozone			R	R	R	N	R		S		R		R	N
Peracetic Acid	S	S		S	R	N	S	S	N	S	S	N	R	N
Potassium Chlorite		S	R	R	R	N	R	S	R	S	R	N	R	N
Potassium Permanganate		S	N	R	R	N	N	S	N	S	S	N	R	N
Sodium Hypochlorite	N	S	S	R	R	N	S	S	S	N	R	N	R	N
Sodium Chlorate	R	R		R	R	N		R	R	S	R	S	R	N
ORGANIC SOLVENTS														
Acetone	N	R	R	N	R	R	R	R	S	R	S	R	R	R
Amyl Acetate	N		R	S	R	R	R		N		S			
Benzene	R	R	R	R	R	R	R	R	N	R	S	R	R	R
Carbon Bisulfide	R	R	S	S	R	R	S	R	N	R	S	R	R	S
Carbon Tetrachloride	R	R	R	R	R	R	R	R	N	R	R	R	R	S
Chloroform	N	R	R	S	R	R	R	R	N	R	S	R	R	R
Cyclohexanone			R	N	R	R	R		S		N			
Diethylene Glycol			R	R	R	R	R		R		R			
Ethyl Alcohol	R	R	R	R	R	R	R	R	R	R	R	R	R	S
Ethyl Acetate	N	R	R	S	R	R	R	R	N	R	S	R	R	S
Ethyl Ether	R	R	R	R	R	R	R	R	S	R	N	R	R	R
Furfural Alcohol			R	R	R		R		N		S			
Methanol	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Methyl Ethyl Ketone	N		R	N	R	R	R		S		S			
Propylene Glycol			R	R	R	R	R		S		R			
Stoddard Solvent	R	R	R	R	R	R	R	R	S	R	R	R	R	R
Trichloroethylene	N	R	R	R	R	R	R	R	S	R	R	R	R	R
Tri Cresyl Phosphate			R	R	R	R	R		N		R			
Toluene	R	R	R	R	R	R	R	R	N	R	S	R	R	R
Xylene	R	R	R	R	R	R	R	R	N	R	S	R	R	R
Naptha	R	R	R	R	R	R	R	R	S	R	S	R	R	S
MISCELLANEOUS														
Acetaldehyde	N	R	R	R	R	R	R	R		R	R	R	R	S
Benzaldehyde	N	R	R	R	R	R	R	R		R	R	R	R	S
Formaldehyde	R	R	R	R	R	R	R	R	R	R	R	R	R	S
Cottonseed Oil	R	R	R	R	R	R	R	R	R	R	R	R	R	S
Glycerine	R	R	R	R	R	R	R	R	R	R	R	R	R	S
Glycol	S	R	R	R	R	R	R	R	R	R	R	R	R	R
Lard	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Linseed Oil	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Mineral Oil	R	R	R	R	R	R	R	R	S	R	R	R	R	R
Nitrobenzene	S	R	R	R	R	R	R	R	R		R	R	R	S
Phenol	N	R	R	R	R	R	R	R	R		R	R	R	S

*Temperature depends on gasketting material.

icals, drug and toilet preparations, foods and nonalcoholic beverages, dyes, emulsions, insecticides, inks, soaps, oils, water, paint and varnish products, petroleum products, gases (respirators and automotive air filters).

A special grade of filter paper is impregnated with synthetic resin, usually a phenolic. This is widely used for air, water, oils, solvents, fuels, gases and some chemicals, also for automotive oil filters and air cleaners. Such impregnated cellulosic material has a pore size ranging from 2 to 25 microns. Operating temperatures are from minus 100 to plus 250 F.

Fabric Filter Media—Natural Fibers

Filter media made of cotton, linen, wool, hemp and silk have long been used in industry. Among the natural fibers being used in quantity for filter media, cotton is still the king and is being used primarily because of its low cost.

There are certain objections to the use of natural fibers for some processes. The pores may become blocked, clogged or plugged under specific conditions and thus retard the fluid flow. This is often the result of the short length of the fibers. Chemical or bacterial action may cause a loss of mechanical strength. Abrasion and fatigue of fibers sometimes cause failures. All of these factors reduce effective cloth life.

Teflon Filter Media

Another outstanding development in filter media made of synthetic fibers is in the use of Teflon. In this man-made fiber the fiber-forming substance consists of long chains of carbon molecules with all available bonds saturated with fluorine. The result is a fiber which is noted for its unsurpassed heat and chemical resistance. It withstands prolonged exposure up to 500 F and it is nonflammable.

Acids, alkalis and organic solvents have no effect on Teflon. The only substances known to react with the fiber are alkali metals, fluorine gas at high pressure and temperature, and chlorine trifluoride. Teflon is nonadhesive so it is a useful release agent for industries in which naturally sticky materials are handled. In addition to all the desirable qualities of

Teflon, it is less costly than sintered porous metal filter media. It is well to remember that here we are discussing a fabric actually woven from Teflon yarn, so that porosity, blinding and strength can be controlled by yarn denier, count and weave.

Developing along a parallel course, Teflon coated glass fabrics are valuable. The excellent chemical and heat-withstanding qualities of fiber glass have long been recognized. By coating these glass fibers with Teflon, the inherent weaknesses of raw glass such as brittleness are corrected. Teflon coated glass fabric does not crack, craze or become stiff or brittle even after prolonged exposure to high temperatures. It has all the advantages of Teflon and withstands abrasion and cut-through to a remarkable degree. It is still lower in price than the woven Teflon and may prove to be an acceptable medium in special applications.

Fabric Filter Media—Man-Made Fibers

Certain man-made fibers have exceptional properties which have either materially reduced or entirely eliminated the factors that contribute to lowered cloth efficiency. For this reason, during the last decade there has been a tremendous growth in the use of man-made fibers for filter media—acetate, Dacron, Darvan, Dynel, nylon, Orlon, polyproplyene, polyethylene, rayon, Saran and Teflon. While filter media made of the synthetics may cost a little more, when replacement, downtime and other maintenance expenses are considered, the synthetics frequently not only prove to be more economical in the long run but also do a better job of filtering besides.

Nylon Monofilament Screen Cloth

This is a recent development for filtering, bolting and screening many operations on wet or dry materials. Under rough and almost unbelievable production loads nylon monofilament screen cloth stands up and outwears other materials including stainless steel wire cloth. For long life, freedom from corrosion, imperviousness to varying temperatures or humidity and all-around clog-proof performance it is very desirable for all kinds of processes.

It is available in a wide variety of mesh openings, from the coarsest of 3360 microns to the finest of 25 microns. It is substantially lower in price than stainless steel wire cloth. Its use is increasing rapidly, since it meets ASTM Specifications.

Monofilament Polypropylene Filter Media

Brand new is the experimental work now going on with polypropylene fabric. This new synthetic is of great interest because the price is being gradually reduced to that of cotton and it has many virtues not possessed by the natural fabric. It does not absorb water, has the lowest specific gravity of any synthetic and is very tough in tensile strength. It is highly resistant to acids and alkalis and has generally good resistance to other chemicals.

The properties of polypropylene fabrics compared with fabrics of equal construction made from other fibers have been determined by one of the producers of these fabrics as follows:

Abrasion Resistance*
400-500 per cent higher than Dynel
25 per cent higher than Dacron
400 per cent higher than cotton
200 per cent higher than Orlon
*Nylon's abrasion resistance is 100 per cent higher than that of polypropylene.

Strength
100 per cent higher than Dynel
200 per cent higher than cotton
100 per cent higher than Orlon
Equal to nylon and Dacron

Polypropylene fabric is presently going into large scale commercial production and is available in a wide range of various weights and weaves. In addition, as this goes to press, the first polypropylene monofilament fabrics are being made in sieving and screening media, similar to the established nylon monofilaments—and they possess the remarkable special properties of this newly created olefin. The development work being done with this synthetic is another example of the progress being made in filter media.

Porous Metal and Porous Ceramic

In the fields of inert metallurgy and ceramics, some unusual and useful products are on the scene. Porous metal filter media fit in where operating conditions such as extremely high temperatures and pressures are not suitable for filters made of other materials. They can be used for corrosive gases, molten sodium, liquid oxygen and for various difficult chemical processes. Porous metal filters are produced by either powder or fiber metallurgy and are usually made in 4, 8, 12 and 25 micron pore sizes. Since they cost more than other media, the cleanability of porous metal filters is an important cost factor.

Porous ceramic filter media withstand temperatures up to 1800 F and differential pressure of 600 psig and up. They stand up to most acids, but not to hydrofluoric acid or hot alkalis. Compared with porous metal filter media, porous ceramics offer definite advantages. They excel in resistance to oxidation, pore size uniformity and ultra-fine filtration potentialities—and they are lower in cost. However, cleaning may be a problem; fine particles may fill the interstices of the porous sections. Sloughing, or shedding of filter particles, may also be troublesome.

Woven Wire Screens

Woven wire screens for filtering are available in a wide range of metals, including carbon steel, stainless steel of various grades, copper, brass, bronze, nickel, Monel, Inconel and aluminum. Silver and platinum and rare metals including tantalum and molybdenum, also are used.

Wire screens are obtainable in a wide variety of mesh sizes, from the coarsest to the very finest. There are many different types of weaves, including square weave, rectangular weave, twilled weave, Dutch weave, twilled Dutch weave, and herringbone twilled weave.

The degree of filtration possible with wire screens ranges from submicronic to 500 microns. Operating temperatures range from minus 420 to 2000 F, depending upon the metal used.

Wire screens are recommended for their shock and corrosion resistance and ability to withstand extremely high temperatures. They have many applications, including uses as filter media for hydraulic fluids, lubricating oils, fuels, gases, water, acids and alkali solutions and solvents.

Wire mesh is also used for screening purposes in the aggregate industries, in the mining of ores, rock, coal

(Continued on page 250)

WATERTIGHT PLASTIC FOAM— A "PLUS" FOR CONSTRUCTION JOBS

WATERTIGHT POLYURETHANE plastic foam, impregnated with asphalt, is being used for sealing and caulking in the construction industry.

This patented sealing tape, marketed under the trade name Compriband, was originally developed seven years ago in Holland and is now gaining acceptance in the United States.

It has its primary application in the building industry, with particular reference to the sealing of all types of joints and materials, such as concrete expansion joints, building curtain walls, window frames, glazing, corrugated sheets, etc. Its reported ease of application by the manufacturer, Asbiton Western, Inc., assures the user of not only satisfactory performance but also an economic cost advantage.

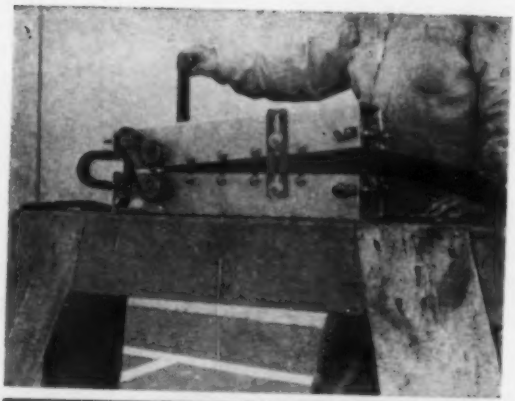
Aside from the building trade, there is a variety of other uses in manufacturing industries, in the automobile, trailer, boat, packaging, refrigeration, electrical and other specialized fields.

In order to be watertight, the material must be held under compression, and in this condition it will build up a very strong bond to the surface of almost any material. It is extremely resilient and will conform to any irregularity of an uneven surface, and a joint can be so designed that an expansion of 100 per cent is possible without loss of sealing efficiency. An asphalt rubber adhesive, applied with a putty knife, is used to prime the surfaces being sealed.

This material is light, clean and easy to handle, has a very long life potential, is chemically inert and can be used through a range of temperature conditions from 160 F to —55 F. **End**

Want More Information?

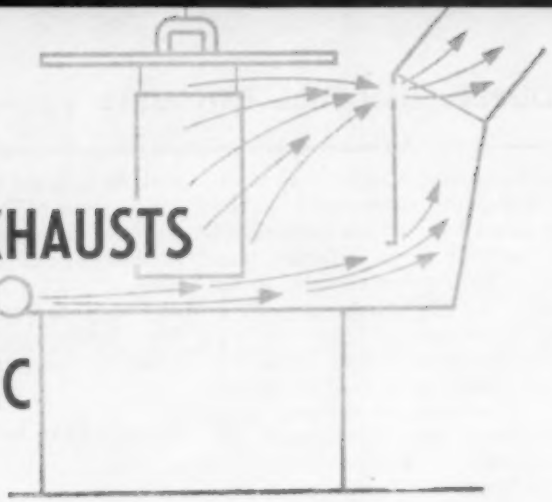
If you would like more information about this product, just write "Compriband" on the post card in this issue or send your request to The Editor, Plant Engineering, 308 E. James St., Barrington, Illinois.



TOP, material being compressed on the job. For a watertight seal, its width must be at lea four times size of gap.

CENTER, pre-compressed seal being applied to one face of wall expansion joint after allowing time to dry primer.

BOTTOM, a completed joint. This clean-to-handle "sponge rubber" polyurethane is impregnated with bitumen.



DOUBLE PUSH-PULL EXHAUSTS SAVE MONEY FOR WESTERN ELECTRIC

By **JOHN W. PETERSON**, Senior Engineer
Western Electric Company, Omaha Works, Omaha, Nebraska

AS IN MOST manufacturing plants, the Western Electric Omaha Works has numerous process exhaust systems which are necessary for the health and safety of plant personnel and the maintenance of process conditions. In the inorganic finishing areas of the Works, there are thirty separate exhaust systems which exhaust over 160,000 cfm of heated air during production periods. These exhaust systems not only represent a substantial capital investment but also add considerably to the equipment required and associated operating cost for supplying heated makeup air to the plating areas.

Also, because of the relatively large quantity of air required to be exhausted from plating tank installations, the hoods and ductwork are of necessity large and bulky. This presents a problem to the design engineer as to the arrangement of the exhaust system so that the system will be effective and yet not interfere with the operator's access to the work.

An opportunity to work on these problems presented itself when it was determined that an additional silicon steel acid pickle unit would be required in the plating area of the Works. This unit was to supplement an existing acid pickle unit for an anticipated increase in the production of silicon steel wire spring relay piece parts.

The physical layout of the new facility was dictated by the space available and the size of tanks and work racks were to be a duplicate of the existing equipment for interchangeability. Figure 1 shows the arrangement of tanks and exhaust system for the new unit. Ten tanks, 3 ft by 4 ft by 3 ft deep, are provided and contain hot caustics, hot acids and associated rinses. Work racks are 6 in. by 18 in. by 26 in. deep and are supported on work bars across the 4-ft dimension of the tanks. See Fig. 2. Racks are lifted and lowered into progressive tanks by an overhead bridge crane.

Preliminary consideration of the type of exhaust system for the new unit centered around lateral slots along two edges of the tanks with plenums below and slot-type hoods to the rear of the acid tanks. This design is used successfully on several plating installations in our plant, particularly on the initial acid pickle facility, Fig. 4.

According to *Industrial Ventilation*[1], the recommended minimum exhaust volume for this type system should be 250 cfm per square foot of tank surface area or a total of 30,000 cfm. Although the rinse tanks associated with the acid and caustic baths would not normally require this magnitude of exhaust rate, it would, in the proposed exhaust, be difficult to vary the exhaust drawn from the various tanks. Also, our experience

[1] "Industrial Ventilation—A Manual of Recommended Practice"—Committee on Industrial Ventilation, P. O. Box 453, Lansing, Michigan. American Conference of Governmental Industrial Hygienists.

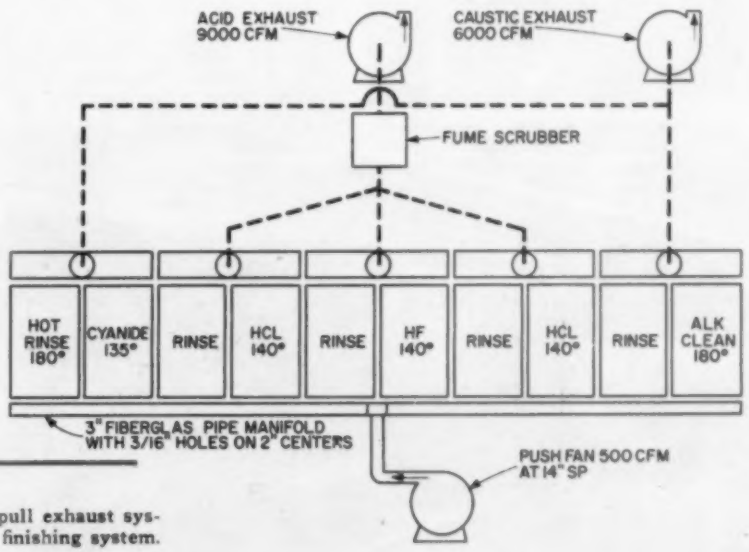


Fig. 1. Schematic arrangement of push-pull exhaust system for the ten tanks that make up one finishing system.

has shown that a higher rate of exhaust than the recommended 120 cfm per square foot for rinse tanks should be used for these particular rinse tanks. This is necessary due to the fuming of parts during rinsing, especially following an acid bath.

Further consideration of the exhaust system in the light of reduced exhaust volume and operator access to the work showed it would be desired that:

1. The exhaust rate per square foot of tank area be reduced.

2. The exhaust be of an uptake type so that fumes from racks being transported from one tank to another would be collected.

3. The operating side of the tanks be relatively free of any exhaust ductwork to facilitate handling of racks.

As a result of the above considerations and of suggestions from several manufacturers of plating room equipment, a "push-pull" exhaust system was designed. The air flow pattern in this type system is shown in the schematic drawing, Fig. 2.

Exhaust Rate Reduced

By using the "push-pull" system the design rate of exhaust was reduced to 125 cfm per square foot of tank area, 15,000 cfm total, or one-half that required for the initial system considered. This rate is as recommended by *Industrial Ventilation* and is confirmed by test in at least one publication for "push-pull" type exhaust systems.

As shown in Figs. 1 and 2, two exhaust or pull systems are provided, one for acid and acid rinse and one for caustic and caustic rinse. Hoods are to the rear of the tanks and slots are provided at the tank lip and above the work rack in the "up" position. The acid exhaust ductwork is of Fiberglas and discharges to the atmosphere through a packed type fume scrubber and PVC-coated centrifugal exhaust fan both mounted on the plating room roof. The fan motor is two-speed and is run at half-speed during non-operating periods.

The caustic exhaust system ductwork is constructed of sheetmetal and discharges to the atmosphere through an unlined centrifugal exhaust fan also mounted on the roof over the plating room.

The push system is supplied by a medium pressure fan which discharges 500 cfm at 14-in. static pressure through a Fiberglas pipe manifold located at the front edge of the tanks.

The manifold has $^{3}/_{16}$-in. holes drilled on 2-in. centers along its entire length to provide the jet effect required. This manifold type push system was selected as opposed to a slot and plenum type so as to provide minimum operator interference.

At this writing the new acid pickle facility has been in successful operation seven months. Although a system of this type is not applicable to all exhaust requiring installations, the apparent advantages for this particular unit are:

1. Exhaust rate is one-half of that required for conventional system, thus, effecting a considerable savings in the volume of heated plating area makeup air required.

2. The lower exhaust rate reduces the size of ductwork which in this case is of relatively costly corrosion-resistant material, thus, effecting a savings in initial cost. It is estimated that the initial cost of this system was 25 per cent less than a conventional slot-type system.

3. The use of the push manifold on the operating side of the tanks, as compared to a slot-type exhaust plenum, allows for greater operator access to the work. **End**

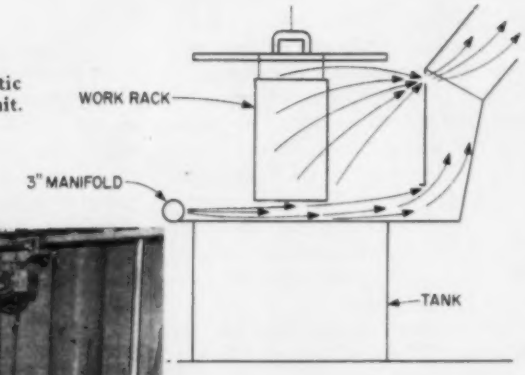


Fig. 2. Right: Schematic elevation of exhaust unit.

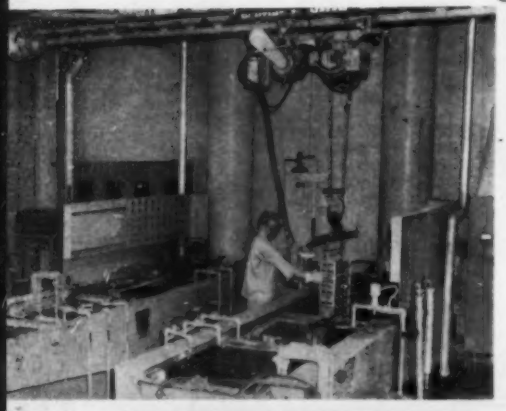


Fig. 3. Left: This photo shows a conventional two-side slot exhaust system at our plant.

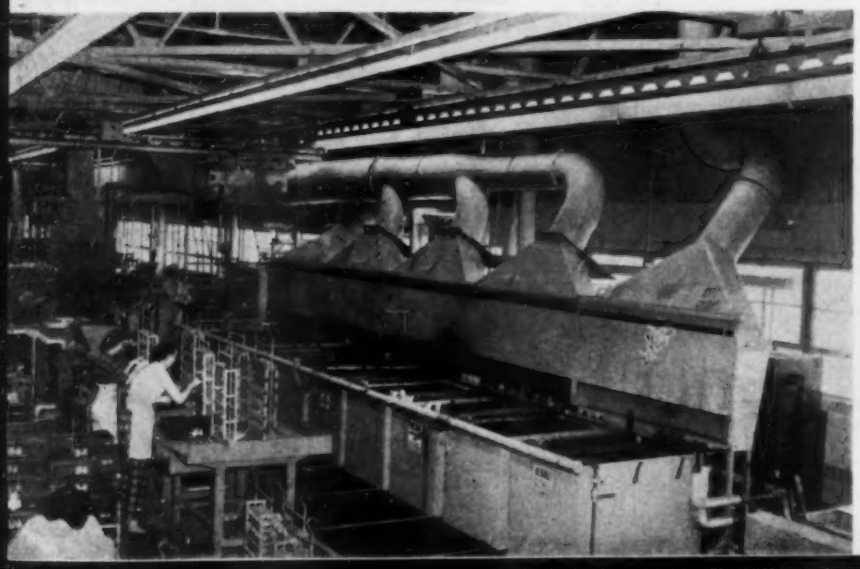


Fig. 4. Below: The three hoods in the center are for acid exhaust. One on each end is for exhausting caustic to the air.

REHABILITATION GIVES BETZ ATTRACTIVE ANALYSIS LAB

North half of the laboratory gives a good view of the facilities. Note the specially-designed tables with knee-hole spaces where adjustable chairs are stored when not in use.

This is just one of the two steam hoods installed in the laboratory. When boiling non-corrosive chemicals, the hoods relieve the heat load as well as reduce humidity.

A REWARDING rehabilitation touch was given an old production area interior by Betz Laboratories Maintenance and Construction Department personnel. The result is a sparkling laboratory where 110,000 water samples can be handled per year. The average sample requires about 10 different analyses and in special cases as many as 20 may be made.

In their facilities conversion work, the workers paneled the ceiling and boxed in overhead roof girders. They also installed the strings of overhead fluorescent lighting fixtures, took care of the over-all electrical work, and did the plumbing and painting.

Floor Surface

The floor was given a new face also; however, this was not done by Betz personnel. Its nice appearance belies the presence of old tongue and groove flooring lying below. A scratch coat of mastic material was applied over the wood, but not directly on it, and this was topped with a finish layer about ⅛ in. thick. The same type of finish material was used for coving at the floor edges. The floor and edges are acid and alkali-resistant and also waterproof.

The second floor laboratory is equipped with 32 sinks. Laboratory table drains are of chemical lead. Distilled water comes from a 750-gallon stainless tank through PVC piping and stainless steel spout fittings. Besides distilled water, other utilities available at the tables are: gas, hot and cold water, and 110-120 v electricity.

Table tops are of colored asbestos-cement sheet material. Table height is three inches more than the conventional 36-in. table. On the basis of experience, this height results in less fatigue due to working in a standing position.

Air conditioning load in the laboratory space is handled by two package units. Three adjoining "special purpose" rooms have separate units, to suit the requirements. One of these enclosed areas is used for x-ray fluorescence analyses of water-formed deposits. Another contains a flame photometer for analyses of extremely low impurities. The remaining one is designated as the "Aquatic Room" where live fish can be studied. **End**

EVALUATING METALS FOR THIRD-RAIL SYSTEMS

By **H. YALE MAGEOCH**, Director, Engineering & Research, H. K. Porter Co. Inc.
Delta-Star Electric Division, Chicago, Illinois

PLANT electrical engineers must have a basic knowledge of metals in order to produce a satisfactory third-rail or sliding-conductor system. Material selected must have good current-carrying capacity, be reasonable in price, withstand certain degrees of corrosion and must present a satisfactory surface for the collecting of current by reason of a sliding or moving contact member. Materials the plant electrical engineer might consider for conductors when developing a third-rail system are shown in Fig. 1.

It will be noticed that electrical conductivity is high with respect to silver, with copper being next in the series, followed by aluminum and thereafter certain forms of bronze and steel. Along with conductivity, the engineer is also concerned with weight and the degree of expansion of the third rail as related to the member on which the third rail is mounted.

In industrial applications many shapes are used. Figure 2, shows various standard forms of wire such as round, figure-eight or the grooved type trolley wire. Wire is generally available in copper or bronze.

Another form of conductor which has been popular is the bar shaped conductor. The tee section is a structural member available in copper, aluminum, steel and bronze, with steel being one of the most popular materials.

Use of the structural angle with a horizontally positioned surface for collecting current has been popular. Some designers prefer to use the angle as an inverted "V," thus serving as a guide for the sliding collector shoe and at the same time providing a dry surface for the shoe to work upon.

Recognizing that certain economies could accrue if third-rail conductors were designed specially for the application, we find new shapes developed such as the inverted "V" with a bar head. This section is available in copper, aluminum and bronze.

Based on the fact that this section was developed for modern third rail use, it will be noted that the materials provide high electrical conductivity, low weight per ampere carried with the ability to withstand corrosion to a greater extent than the ferrous materials previously used.

Along with this section is a dumbbell-type section which has been developed for lighter current-carrying capacity. This shape has found wide use throughout the country and is available in copper, steel and bronze.

In order to make an appraisal of the area and related weight of various materials of equal direct current resistance, Fig. 3 shows the relative circular areas required for silver, copper, aluminum, bronze and steel. A bar graph shows the relative weight for the various materials.

With this information it is possible to make an appraisal of the material which gives the most advantageous features with respect to size, space required and the weight involved.

While studying the materials from the electrical engineers' point of view, we come across a phenomenon which

Mr. Mageoch is now retired from Delta-Star

Fig. 1. Common materials the plant engineer might consider for conductors when designing a third-rail system.

MATERIAL	RATIO TO HARD DRAW COPPER			
	CONDUCTIVITY	WEIGHT	LINEAR EXP.	MELTING POINT
COPPER (HARD DRAWN)	100%	100%	100%	100%
COPPER (ANNEALED)	103	100	100	100
SILVER	111	118	112	89
ALUMINUM 6063-T6	54	30	137	61
ALUMINUM 6061-T6	41	30	137	61
BRONZE-(57% Cu, 40% Zn, 3% Pb)	29	95	124	82
STEEL (STRUCTURAL)	14	87	72	139
STEEL (ASCE RAIL)	10	87	72	139

DATA ON HARD DRAWN COPPER AT 68 F					
COPPER (HARD-DRAWN)	R IN OHMS PER MIL-FOOT	ELECTRICAL RESISTIVITY MICROHM PER CUBIC CENTIMETER	WEIGHT IN LBS PER CUBIC INCH	COEFFICIENT OF LINEAR EXPANSION PER DEG.F	MELTING POINT F
	10.65	1.77	0.3211	0.0000094	1981

DESCRIPTION	COPPER	ALUMINUM	STEEL	BRONZE
WIRE	X			X
BAR	X	X	X	X
TEE-SECTION	X	X	X	X
ANGLE SECTION	X	X	X	X
ASCE RAIL			X	
SPECIAL PURPOSE INVERTED "V" TYPE	X	X		X
SPECIAL PURPOSE	X		X	X

Fig. 2. Various shapes available for industrial third-rail systems. Wire shapes are generally of copper or bronze.

the engineer must consider. In the case of materials such as silver, copper, aluminum and bronze, we have materials of a non-magnetic nature. However, where magnetic ferrous materials are involved, they have a marked influence on the effect of the voltage and current when employed as an electrical conductor for alternating currents.

Should we select two materials of equal cross section, one of non-magnetic character and one of magnetic character carrying a given current of 100 amperes, we would find a magnetic field developed around and within each of the conductors, Fig. 4. We find relatively few lines of force associated with the non-magnetic conductor, while the lines of force associated with the magnetic conductor are relatively great.

It is understood by the electrical engineer that this is a well-known characteristic and that the difference in the number of lines of force is reflected in the magnetic permeability of the material. With the existence of the magnetic field, we know that the flow of the magnetic lines of force or flux is related to the flow of the current through the conductor.

As long as the current flows steadily in one direction, the flux will hold a steady pattern. However, if the current is varied the flux will vary generally in proportion to the current.

By way of demonstration, Fig. 4 shows relatively few lines of force of flux around the non-magnetic conductor, yet the magnetic conductor has a much greater number of lines of force. This is due to the permeability of the magnetic material.

With these conductors carrying an alternating current, there will be a voltage generated in the reverse direction when the lines of force collapse during the time the voltage is passing through zero.

Magnitude of the reverse voltage will be much greater in the case of magnetic material than in non-magnetic material. Thus, we find ourselves concerned with two conditions: impedance of the conductor as created by reverse voltage and increase in resistance of the conductor caused by changing lines of magnetic flux. This forces the current to select a zone toward the outer diameter of the conductor, thus increasing the effective resistance of the conductor when used for alternating current purposes. This increased resistance is known as skin effect and is quite marked with magnetic conductor materials.

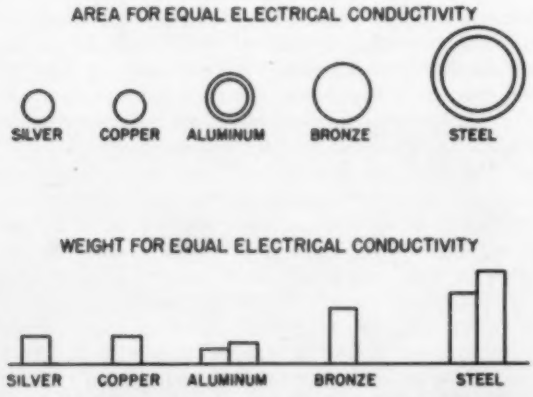


Fig. 3. Comparison of circular areas for equal direct current resistance and relative weights for common materials.

In order to investigate skin effect when using magnetic conductors, a test was made, Fig. 5.

In some instances, such as that of a 3½-in. standard iron pipe, the ratio of alternating current resistance to direct current resistance will be found to be close to 13 to 1. Had the pipe been of copper, the skin effect ratio would have been 1.02 to 1.

Use of steel as a third-rail conductor member was introduced during an era when direct current was the only power source used for the operation of moving equipment. Later as alternating current started to become popular, efforts were made to continue to use the steel conductor and in many instances to augment the steel conductor with a copper booster. Among the most popular applications of the steel-copper booster principle were those shown in Fig. 6.

Laboratory tests were made on steel-copper combinations, Fig. 7. Under "A" you will notice that a steel bar located at the left is associated with a copper bar with one-quarter inch spacing between them. Likewise under "B" two steel angles are shown in relation to a centrally located copper bar with a one-quarter inch space between each of the angles and the bar.

Referring to Fig. 8, it will be seen the 4-in. by ¼-in.

Fig. 4. Magnetic flux around a magnetic conductor is greater for a given current than a non-magnetic conductor.

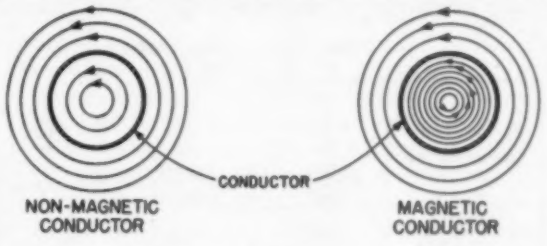
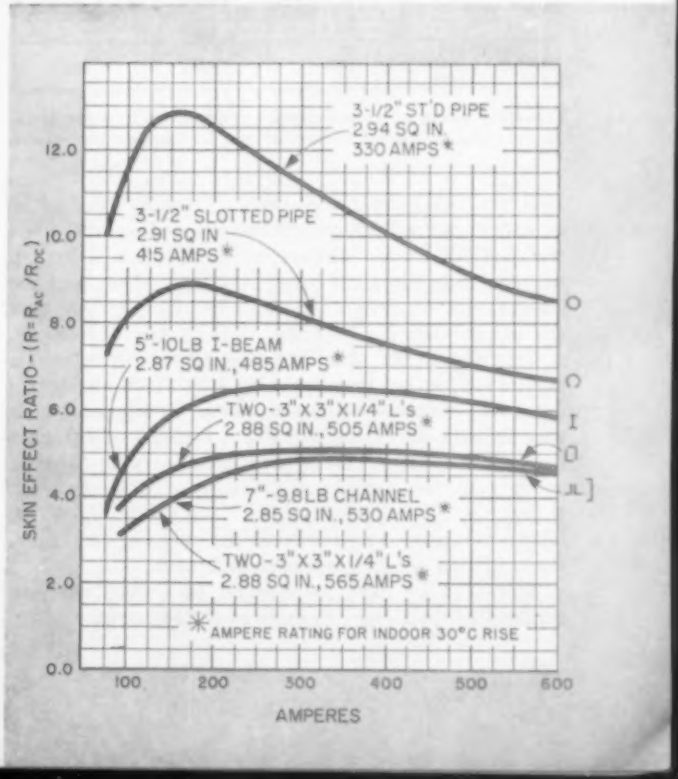


Fig. 5. Results of a series of tests made to explore skin effect using magnetic conductors on alternating current.



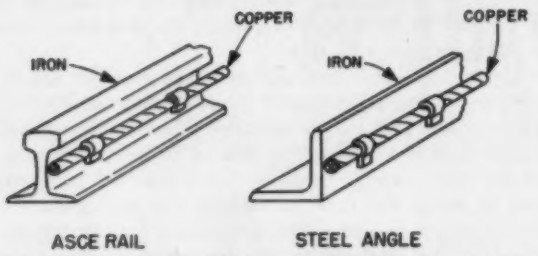


Fig. 6. Copper conductors are used in parallel with steel conductors to try to improve current-carrying capacity.

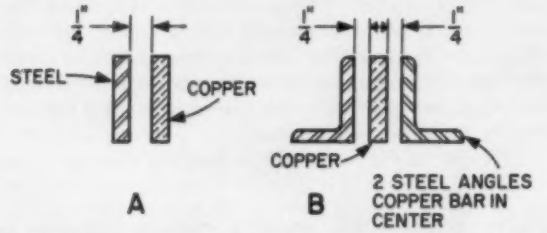


Fig. 7. Laboratory tests made on combinations of steel and copper conductors to determine total current capacity.

CURRENT CARRYING CAPACITY AT 30 C TEMP RISE

CONDUCTOR CONFIGURATION	STEEL BAR 4"X1/4" ONLY	COPPER BAR 4"X1/4" ONLY	COMBINATION
"AMPERES" CURRENT CAPACITY AT 30 C RISE	210	1250	1070
CONDUCTOR CONFIGURATION	2 STEEL ANGLES 3"X3"X1/4" ONLY	COPPER BAR 3"X1/4" ONLY	COMBINATION
"AMPERES" CURRENT CAPACITY AT 30 C RISE	565	950	930

Fig. 8. Placing steel and copper conductors in close proximity reduces capacity below that of copper bar alone.

steel bar, will carry 210 amperes. A similar 4-in. by ¼ in. copper bar will carry 1250 amperes. However, when the steel and copper bars are installed with a ¼-in. gap between them, the total current-carrying capacity of the combination becomes 1070 amperes. This is less than the current-carrying capacity of the copper bar alone.

Referring to the chart showing the two angles and a copper bar, we see that two 3 by 3 by ¼-in. angles will carry 565 amperes. However, when the copper bar is sandwiched between the two angles having a ¼-in. space between each angle, the total current-carrying capacity of the assembled component becomes 930 amperes which is less than the copper could carry by itself. Should we reduce the space to zero between the steel and the copper, the condition becomes worse in each case.

Now that we have investigated the current-carrying capacity of steel and copper in proximity to each other, let us look into the regulation or voltage drop that exists when copper and steel assume this close association.

A copper and steel combination was investigated for a three-phase installation using 3 by 3 steel angles on 18 in. vertical spacing with three 500,000 circular mils copper conductors in parallel. Taps between the copper conductors and the steel conductors were made on three-foot centers. Figure 9 shows results of this test.

The impedance per thousand feet with the copper conductor mounted directly against the steel member is 0.120 ohms. It has been noted on the graph that the impedance of copper only is 0.106 ohms, thus it can be seen associating copper with steel has actually increased the impedance of the combination above that of the copper itself.

By moving the copper away from the steel it is possible to reduce the impedance of the over-all system. In this instance, it would be advisable to move the copper at least 15 to 18 in. from the steel which reduces the impedance to approximately 0.082 ohms per 1000 feet.

As impedance of a third-rail system is related to the voltage drop of the system, it is apparent that the copper should not be too closely associated with the magnetic conductor.

All comments made so far have been related to the use of conductors for 60 cycle alternating current. In the application of direct current, a conductor system is not faced with such factors as impedance and skin effect, therefore, it is quite practical to parallel steel and copper conductors for the purpose of reducing voltage drop.

With direct current rapidly giving away to alternating current for operation of heavy machinery, it is desirable to employ a conductor material that will not have the disadvantage of high impedance with high skin effect. We must look toward the non-magnetic materials. These materials have higher electrical conductivity, thus permitting the over-all cross section of the conductor to be reduced.

For the purpose of solving many of these problems the special aluminum conductor system employing an inverted "V" shape was developed. This system has been used for all types of industrial applications with considerable success due to simplicity of installation and improved electrical characteristics.

The importance of holding impedance of a system to a minimum has been stressed, however it was not mentioned that impedance could be reduced by reducing the spacing between the two conductors. We are assuming that the conductors carry like current but in the opposite direction.

To demonstrate the effect of reducing the spacing between the conductors, Fig. 10 shows the result of an actual test made on inverted "V" conductors where the spacing in inches between the conductor has been plotted with respect to the ohms of impedance per thousand feet of conductor.

Due to high conductivity it is possible to mount the non-magnetic conductors on shorter spacing than would be possible with the more bulky steel conductor. If the steel conductor must be supplemented with a copper booster, the space required will be even greater.

In addition to electrical characteristics, certain mechanical considerations must be taken into account. In some instances, where the installation is backed up by consid-

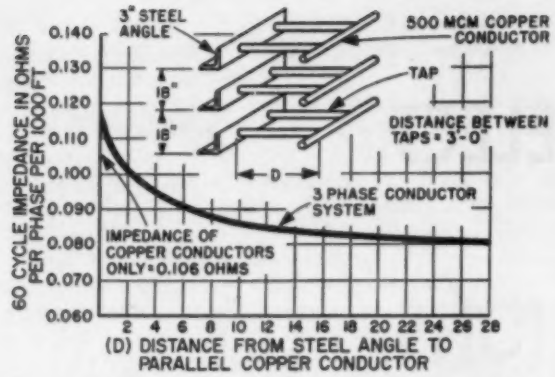


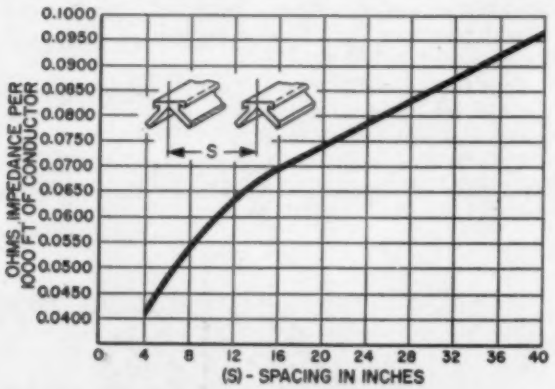
Fig. 9. Increasing the distance between the steel rail and copper booster lowers the impedance of the combination.

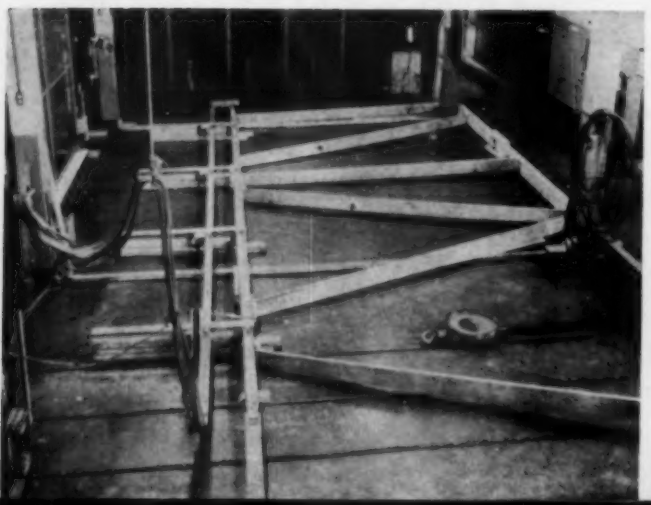
erable electrical energy, a short circuit on the system may develop mechanical forces which must be taken into consideration.

In order to have a feeling for these forces, a laboratory test setup was made, Fig. 11. This shows two conductors of the inverted "V" aluminum type, 1000 ampere capacity, in parallel relationship with means provided for varying the current and measuring the mechanical force developed between the two conductors.

From this test setup, data was secured which has permitted us to develop the curve shown in Fig. 12. This curve has been plotted employing a 12-in. spacing between conductors with the current applied varied and the forces

Fig. 10. Impedance can be reduced by close spacing. Smaller copper conductors can be mounted closer together.





measured and converted to pounds per foot of conductor. The currents indicated are for symmetrical root mean square current values.

If forces are required at distances other than the 12 in., the force varies inversely with the distance between the two conductors and directly with the square of the current. The forces indicated on the graph are those as measured under test. In practice it would be wise to apply a safety factor for alternating current circuits as considerable vibration results when heavy currents are caused to flow through the system. As a minimum, it would be considered that we should apply a factor of three or that usually applied for a live load.

In third-rail systems it is standard practice to permit considerable play between the conductors and the supporting brackets in order to allow for expansion and contraction. With this play allowed in the system, a definite hammer blow is observed under test conditions when the short circuit force is applied. This blow occurs either outward or inward depending on the direction of flow of the current. In a normal installation where single phase currents are flowing opposite to each other, the force on the conductors is outward.

The degree of looseness between the conductors and their associated supports would have a bearing on the amount of energy stored in the conductor as it moves to deliver a blow against its restraining member. For the inverted "V" aluminum system with its associated supporting members, it would be estimated that a factor of safety of no less than 5 should be employed to allow for the resultant impact.

Where short circuit forces are a consideration, it would be wise to consider increasing the spacing between the associated conductors in order to decrease the effect of this force. By increasing the spacing between the conductors, the reactance of the conductor system will be increased, thus serving as a current limiting means unless the short circuit occurs very close to the feeder point.

As modernization has taken place, many old installations employing magnetic conductors have been replaced with the non-magnetic system. **End**

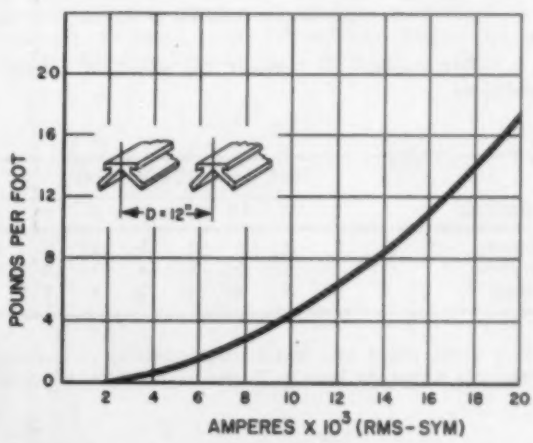


Fig. 12. Curve of mechanical forces developed on conductors arranged on 12-in. spacing due to heavy current flow.

Fig. 11. Test setup used to determine mechanical forces developed between conductors due to heavy short circuit.

BOOKLET HELPS SELECT INDUSTRIAL HOSE TO FIT THE CONDITIONS

Selecting the right industrial hose need not be a problem. After determining the size, pressure and any special requirements of the application, just refer to this hose booklet to find the answer

THERE ARE MANY different types of industrial hoses which have been specially built by manufacturers to fit a wide variety of applications. Being able to determine the working characteristics of these hoses and to find the correct one to fit your particular need will assure you of long periods of uninterrupted operation.

To assist you in evaluating the various types of hoses, a hose finder booklet from the Gates Rubber Company is available which will do two things for you:

1. It will lead you to the best hose for either a common or uncommon application.

2. It will give you all the application data on a particular type of hose.

In addition to helping you select the right hose, other information on the performance of each element of each hose is included. Such as:

1. Tube ratings—to evaluate the effect of the material conveyed.

2. Reinforcement data—to evaluate pressures, flexing, etc.

3. Cover ratings—to evaluate the effect of external conditions.

	TUBE AND COVER TYPES								
CHEMICAL	A	B	C	C3	D	F	G	H	J
Acetone	3	2	X	X	3	3	3	1	1
Kerosene	1	1	1	1	X	X	1	X	X
Phenol	3	X	X	X	3	3	X	1	-

Table gives tubes and cover characteristics for three chemicals which the hose in Example One should handle.

By referring to the data on the 2-in. hose chart, right, we find that the recommended hose for Example One is 24HB.

Tube and Cover Ratings

The chemical and physical properties of tube and cover types are subject to a considerable amount of control through compounding.

Characteristics given are therefore generalized to some extent. Temperature range is normal but can usually be extended in either direction for special applications.

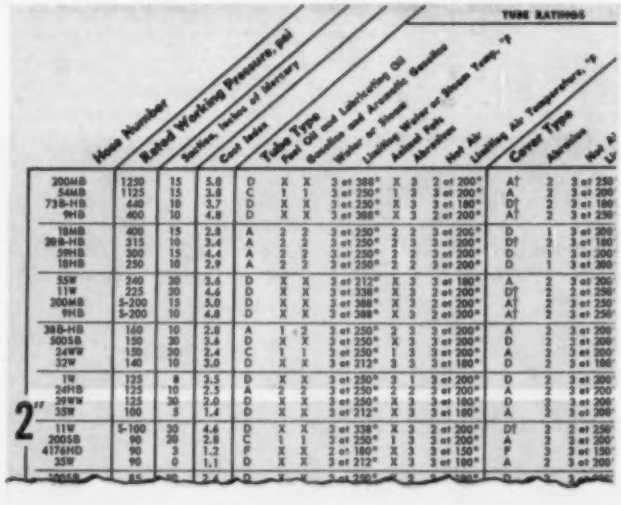
Type A has general characteristics of polychloroprene compounds. Fairly good heat resistance, least inflammable, self-extinguishing. Tends to swell somewhat in oils and gasoline. Temperature range —20 F to 250 F.

Type B is based on polysulfide organic dihalide. Good resistance to solvents and can handle lacquer thinners. It is hard to process and is high in cost. Recommended for paint spray hose. Temperature range —30 F to 150 F.

Type C has general characteristics of a copolymer of acrylonitrile and butadiene. Better oil, gasoline and solvent resistance than Type A but not as good as B. Range —20 F to 250 F.

Type C3 is a modification of Type C—has same oil and gasoline resistance as A but is more like C for other solvents. Range —20 F to 250 F.

Type D compounds are based on natural rubber or copolymers of styrene and butadiene. Good abrasion



resistance. Range —30 F to 250 F but can be compounded up to 388 F. Most commonly used where oil resistance is not needed.

Type F is reclaimed from goods originally made of Type D stock. Good for air and water hoses. Range —20 F to 150 F.

Type G is based on plasticized polyvinyl chloride. It has good flex life. Resistant to sunlight, aging, oxidation and many chemicals. Range —10 F to 120 F.

Type H has general characteristics of copolymers of isobutylene and isoprene. Good resistance to permeation by gases, heat, acids and other chemicals. Range —30 F to 250 F.

Type J is a compound based on polyethylene. Good resistance to many chemicals. It is flexible from —90 F to 185 F.

Rating System

The following rating system is used on the data pages and in the Chemical Resistance Table to indicate the resistance of the hose to various conditions or materials.

1. Excellent resistance—the hose will probably not fail because of this material or condition alone.

2. Good resistance—the hose can be expected to give satisfactory service, but it may fail because of this material or condition.

3. Fair resistance—if hose is exposed to this material or condition infrequently or to only a limited extent, it will probably give satisfactory service. Under continuous service, the hose will fail because of this material or condition, but will give some service and may be used if it is the only hose available.

X. Not recommended.

The following examples will give you an idea of how this booklet can be used and the amount of information you can obtain from it.

Example One:

A refining company needs 2-in. hose in 25 ft lengths to unload tank trucks to underground tanks at 50 psi. These hoses will be carrying acetone, kerosene and phenol at 70 F. For this working pressure, there are a number of hoses available.

The first thing to do is check the Chemical Resistance Table for the chemicals being handled to determine which tube type or types will suit this operation.

Referring to the table we note that the only stock that is recommended to some degree for all the materials which will be handled is Type A. After checking the page which lists the 2-in. hose for 50 psi working pressure or higher with the Type A tube stock, we find six possibilities—18MB, 20B-HB, 59HB, 18HB, 38B-HB and 24HB. The cost index is then the final factor in deciding which hose to use. We find that the 24HB hose, rated at 125 psi with a cost index of 2.5 is recommended for this service.

Example Two:

A spraying company requires 100 feet of ½-in. hose at working pressures up to 600 psi. Most spraying solutions have a water base, but 2,4-D and 10 per cent fuel-oil solution is also sprayed on weeds.

For this application, you would refer to the ½-in. hose chart in the booklet.

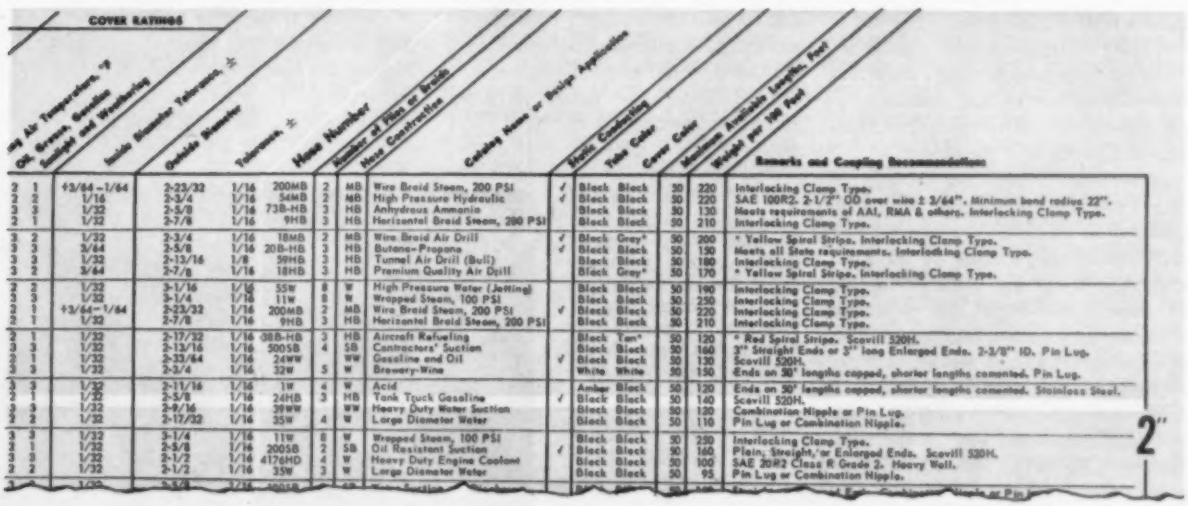
After checking this, refer to the Chemical Resistance Table to see which tube stock is best for the conditions involved. The table shows that Types A and C stocks are the only ones which will be suitable. (Table and hose chart not illustrated for this example.)

Again, referring to the hose chart, we find that four hoses are listed with Type C tube stock but there are none with the Type A stock.

A further check is made of all four to determine which one will best fit our requirements. Note under the heading "Catalog Name or Design Application" states that hose Type 17B is recommended for "High Pressure Agricultural Spray." The 17B hose was selected for this particular application. **End**

How To Get Booklet

If you would like to receive a copy of this booklet "Industrial Hose Finder" kindly send your request, on company letterhead, to the Editor, Plant Engineering, 308 E. James Street, Barrington, Illinois.



FIRE-WARNING SYSTEMS FOR COMPUTER CENTERS

By F. M. GIBSON, Engineering Department, American District Telegraph Co., New York, N. Y.

SHORTLY AFTER 12 o'clock one night recently, an almost indiscernible wisp of smoke curled slowly from a computer in the data-processing center of a large aircraft manufacturing plant. An overheated transformer was beginning to break down, well on its way to causing a potentially high-loss blaze.

But before personnel in charge knew trouble was brewing, fire fighters and technicians were sniffing out the faulty component. A smoke detection system had alerted them almost as soon as the first curl of smoke drifted upward, and because of this early detection, damage was averted. It is interesting to note that the fire report issued afterward stated: "No open flame or fire was found by the fire department."

Already employed by a majority of large corporations, electronic data machines will be even more widely used in the future. The amazing capability of these electronic brains to perform complex operations at lightning speed has made them indispensable to thousands of industrial, commercial and scientific organizations.

Engineers can now perform in minutes computations that previously required months, if not years, of human calculations. Business offices, banks and other firms are able to handle accounting procedures and maintain financial, inventory and merchandising records far more efficiently than they ever imagined possible.

In fact, as greater use is made of these complex machines, industrial plants soon find that the efficiency of daily operations hinges to an awesome degree on the work performed by them. But while the electronic brain has opened new concepts in data processing, it has also tended to make its users particularly vulnerable to a costly interruption of work in event of breakdown—and one of the most likely causes of an extended breakdown is fire.

An illustration of the calamity that can be caused by fire occurred in the Pentagon's Air Force Statistical Center on July 2, 1959. In addition to the destruction of more than six million dollars' worth of computer equipment, the blaze also destroyed more than 5000 reels of magnetic tape containing a vast amount of classified data on the Air Force's world-wide operations. The loss of these reels created a staggering record-retrieval program.

Why is fire an ever-present possibility, even when the building or data-processing center itself is of fire-resistant construction, as was the case in the Pentagon? Principally because of the great number of electrical components and miles of wiring found in automated installations—wiring that runs beneath floors, behind ceilings, and through computers and auxiliary apparatus, such as power switchboards and transformer installations. Then, too, much automated equipment normally generates a tremendous amount of heat when in operation, making the risk of fire even greater.

Since fire in a data-processing or automation-control center is apt to be electrical in origin, and since the characteristics of electrical fires are well known, the method of best protecting such an installation is clearly indicated. That method, of course, is through automatic smoke detection and alarm service.

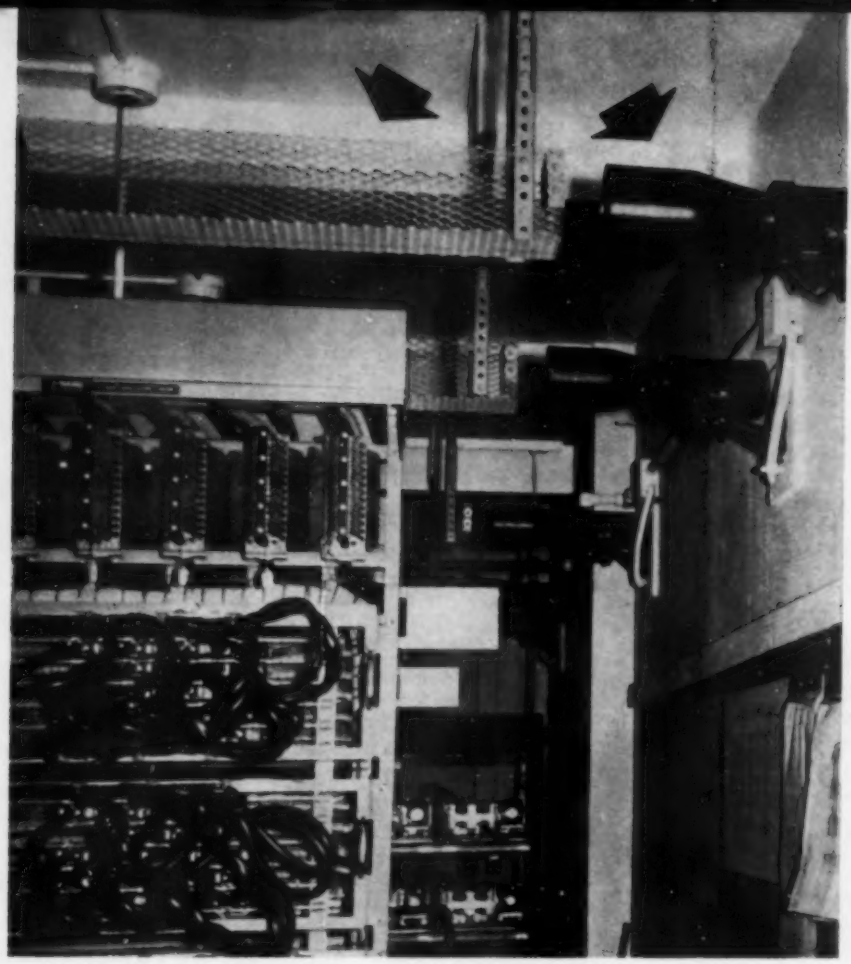
Electrical fires generally smolder for long periods before the smoke is detected by humans, or before the first flicker of flame erupts. During this initial burning stage, the small amount of heat released is generally far from sufficient to activate a heat-responsive fire alarm system, especially when the air temperature in an equipment center is rigidly controlled by air conditioners, and the smoldering goes on unnoticed.

A smoke detector, however, quickly sounds an alarm when even the smallest wisp of smoke intercepts a beam of light projected across the protected area.

One of the protection companies which offer this service is the American District Telegraph Company, a nationwide organization which safeguards more than 62 billion dollars' worth of property against fire, burglary and other hazards. Automatic smoke detection and alarm service has proved of inestimable value in safeguarding the Western Union Telegraph Company's automatic switching centers throughout the country. The equipment in these switching centers is of the same intricate electronic design found in computer and automation control centers, and is subject to the same fire hazards.

The effectiveness of smoke detectors in safeguarding automatic switching centers has been demonstrated at Syracuse, N.Y., where on three separate occasions, the overheating of a

Manned 24 hr a day, ADT central stations supervise smoke detection and other alarm systems. Tape registers in foreground record all fire alarms.



Smoke detection system safeguards switching center against fire. Units mounted on wall receive light beams projected from light sources on opposite wall. Metal cages prevent accidental interruption of the light.

1/75-hp motor small enough to hold in the palm of your hand has caused alarms. In not one of these incipient fires did any of the employees in the room see or smell the tiny wisp of smoke before the alarm sounded. But because of the quick operation of the smoke detector, the employees were able to take prompt measures to correct the condition. Total damage on these three potential fires was estimated at $10, and this, indeed, is in startling contrast to the Pentagon's multimillion-dollar loss.

Ability to detect potential fire swiftly, automatically, is only part of the service provided by smoke detection systems. In addition to the sounding of a local warning bell, such systems signal a central station service.

Simultaneous with these alarms are other precautionary measures that can be taken automatically: the cutting off of power to data processing and air conditioning units, and the closing of dampers and air-circulation fans to lessen the possible spread of fire and smoke.

This fast, correlated action makes it possible to investigate and remedy trouble immediately, and to have fire fighters on the scene to control an outbreak, if there is one, in its earliest stages.

Not to be overlooked in the protection of data processing are the small rooms adjoining these areas which are used to store tapes or other data-recording media. Destruction of these tapes could be every bit as calamitous and costly as destruction of the equipment itself. In these small areas, "spot" detectors are generally recommended and used instead of the projected-beam smoke detectors.

At a large container-manufacturing plant in New Jersey, where electronic computers play a vital role, an ADT smoke detection system alerted personnel to trouble in such a tape-storage room. Summoned by the local alarm, employees discovered a smoldering, overheated coil in an electrical air-warming device. The trouble was corrected, with no loss reported.

With increased use of automation in industry, a relatively new fire hazard has developed. This is in the control centers for the large number of electric motors used in automatic production systems. Motor control circuits and equipment are usually housed in metal-enclosed compartments called "control centers," which in turn are located in a special room.

Hundreds of multiconductor cables leading to motors and associated equipment are also located in these rooms. A fire in such a control center can halt production for weeks, even though it might not escape from the small area involved.

In fact, one recent fire involving a motor control center room caused a plant shutdown of six weeks. Losses from business interruption combined with property damages reached high in six figures.

Automatic smoke detection provides ideal protection for these control rooms since overheated conductors or minor short circuits would produce smoke long before serious damage could be done.

Alarm systems must not only react promptly to fire and burglary threats, but must also be ready to operate during every second of the day. Dependability rests on a number of factors, of course, but two of the most important involve proper maintenance and electrical supervision.

Experience has taught that if any protection device or system is to be ready for instant operation, it must receive a regular, scheduled program of rigid tests and inspections. When alarm systems are provided as a service rather than an outright sale of equipment, the subscriber is assured of thorough maintenance by protection specialists—relieving him of the cost, time and labor involved.

The second factor that assures dependability of alarm systems is supervision provided twenty-four hours a day by a central station organization. If a system becomes inoperative for any reason, including malicious tampering, central station operators automatically receive a trouble signal. They promptly notify the subscriber's representative and initiate whatever corrective action is necessary to restore protection. **End**

PHONE HOOKUP REDUCES INVENTORY TIME

TIME required to take an annual physical inventory of parts on hand has been reduced to one-third. The Pacific Coast repair base of Continental Can Company's Cannery Equipment Service in Hayward, California, has accomplished this feat by using battery-operated telephones.

Approximately $1,000,000 worth of parts is kept on hand at the base to service customers all over the west. A perpetual inventory is maintained, but once a year physical inventory is taken of every item in stock. Formerly the job took eight employees about three weeks to perform, with a considerable amount of overtime. The same task now occupies four people part time only 10 days without overtime.

Headsets and transmitters similar to the type used by switchboard operators are worn by the inventory-takers. The power source consists of eight large dry cells in a battery pack located in the shipping office. All equipment necessary for the system was bought—used—for about $200. Communication is via wires 200 ft long; the wires are strung over sprinkler pipes to keep them off the floor and allow the users maximum freedom of movement.

In essence, the system merely involves two men at the bins phoning in the contents of each compartment to two girls in the shipping office. As refined, the procedure is to line up three tubs of inventory cards and to seat a girl on either side of the row of tubs. Of the nine trays in the tubs, five contain about 20,000 active cards. Inactive cards, for parts used every one to three years, are also accessible.

The old way was for a man to take a part off a shelf and write a ticket in duplicate showing the part name, number and quantity. One copy was left on the shelf with the part and the other torn out of the book after all tickets were written. Then the torn-out tickets had to be sorted by number —a tremendous undertaking.

Now the method is for two men to begin at opposite ends of the row of 16 bins, each of which has nine sections on each side and seven to ten shelves. Taking one shelf at a time, a man removes and dusts the parts and calls out the part number; for example "Number 219243." Having both hands free he can move along much faster than before.

The girl, recording the information, scans the trays and usually locates the proper card in a second or two. As a check, she replies with the descriptive name of the item: "Outer half mold." Thus, there is virtually no chance for error.

In the brief time it takes for the girl to seek the right card, the man at the bins is counting the number of parts in the compartment. When the girl finds the card, she stamps the date and enters the quantity. Compartments are plainly marked, so that, typically, the man will first call out "F-1-4"—referring to bin, section and shelf identification, respectively.

The system is also a check on location of parts, to make sure that they have not been misplaced in error.

One of the principal advantages is in the matter of discrepancies. Previously, tickets had to be compared with cards, and if they did not agree someone would have to go out to the bin and physically recheck the item. Using phones, if there is a discrepancy, a recount can be made right at the time and place it arises.

During inventory-taking, when the girls stamp cards and enter quantities, they hand the cards to a clerk who posts the information on inventory sheets. This may also be done at intervals during the day. Afterward the cards are returned to tray files. **End**

Two men, wearing telephone headsets, can use both hands in taking inventory. Wires are strung over sprinkler pipes.

Girls in office, also equipped with headsets, record data on file cards as "called in" by men taking inventory.

CONSTRUCTION SPECIFICATIONS

By R. E. WALLIN, Chief Engineer, Construction, Plant Engineering Dept.
Joseph T. Ryerson & Son, Inc., Chicago, Ill.

BAR JOIST ERECTION

OPEN WEB steel joists are comparatively new in the construction field. Their use is becoming more and more popular as an alternate material for solid web rolled steel members, fabricated structural steel members, and wood plank members.

Long-span units for floor and roof girders and trusses are available in lengths from 30 ft to 96 ft. They take the place of rolled wide-flange steel beams, or structural shop fabricated girders and trusses, or heavy wood timbers for supporting floor joists and roof rafters or purlins. Steel joists for use as floor joists and roof rafters or purlins are available in lengths from 7 ft to 48 ft. Steel joists can also be used as an alternate for other miscellaneous units where rolled steel beams and channels and wood planks (2 in. and heavier) are ordinarily used.

Architects, engineers, and contractors lean toward the use of standard steel joists and long-span units because they are more economical in cost and more easily erected in any weather; they are fire resistant; they are permanent and nonshrinking; they are termite- and rot-proof; they are open to give a free way for piping and ducts of the mechanical trades; they are light in weight; and they can be bought to standard dimensions and carrying capacities.

Standard steel joists, identified as "S" series, and long-span units, identified as "L" series, produced by reputable manufacturers, are made in accordance with standard specifications issued by the Steel Joist Institute.

Two kinds of high-strength steel joists, identified as "H" and "J" series, and one type of high-strength steel long-span unit, identified as "LA" series, were recently developed by the Steel Joist Institute. They are designed to reduce dead weight and at the same time provide the strength specified for the job.

MATERIALS. The important point for architects and engineers to cover in their steel joist specifications for any job is that the joists and long-span units are to be manufactured in accordance with the standard specifications and load tables published by the Steel Joist Institute. Identification of the units on the drawings is easy because every unit listed in the tables has a type number.

Attention should be called to the accessories to be furnished, such as bearing plates, end wall anchors, bridging, ties, etc., which may be called for or detailed on the plans.

Very definitely it should be emphasized that the units are to be manufactured by approved and reputable sup-

Fig. 1. Typical installation of open web steel joists. Here, they will be used to support an upper floor slab as well as roof deck and roofing.

pliers because, in less thickly populated areas. many inexperienced small shops will claim that they can fabricate the units, and, without the benefit of jigs and fixtures and welding operators experienced on this type of work, they may produce units that would fail.

UNLOADING. It should be pointed out that the units should be carefully handled during unloading and should be stacked for storage, if they are not erected immediately, in such a manner that the camber of the units is not disturbed and that the units as a whole or any parts of them are not damaged.

They should also be properly protected against any kind of damage while in storage.

INSTALLATION. The units and accessories for same should be erected in accordance with the shop drawings furnished by the supplier of the units. These shop drawings must be based on the designs of the architects and engineers who prepared the design drawings.

The units should be placed exactly in the locations shown on the drawings, with the tops in line to receive whatever construction goes onto them above or below.

It is most important that the units be welded to other framing or anchored by other means to give full bearing as intended by the plans.

It is also important that bridging and all accessories be installed where specified and in accordance with standard practice so full strength of the units is developed.

STEEL ROOF DECK

For many years the most widely used material for roof deck was wood. Then precast and poured concrete or gypsum for roof deck came into favor. In recent years both painted and galvanized formed steel sheet deck have been used. Our typical building project included steel roof deck.

A good roof deck must be strong enough to support the insulation and roofing, noncombustible in composition and light in weight, with wide range of spans and features, for economy. Steel deck seems to meet these specifications, and is also available in a form that provides acoustical value.

Architects and engineers will design the deck with the help of manufacturers' literature and by referring to specifications of the American Iron & Steel Institute and Metal Roof Deck Technical Institute. The deck manufacturer will detail and specify the component parts and accessories, and these data must be checked by the architect to assure compliance with the plans.

UNLOADING. The contractor should unload all material immediately upon delivery, whether he is ready to use it or not. He must be held responsible for any delays in unloading, and generally is required to pay all demurrage, truck detention, or special handling charges which occur after arrival notice.

The contractor should be required to inspect each shipment prior to and during unloading. He should immediately provide for replacement of damaged pieces so there will be no delay when work starts. The contractor should be held responsible for all damaged materials resulting from exposure to the weather, handling, or storage, and should replace such parts without cost to the owner.

Fig. 2, top. Long span metal roof deck, as installed over joists. Gravel stop is being tack-welded to metal deck.

Fig. 3, bottom. At lap points, metal roof deck is welded to its supporting steel, so it will withstand uplift forces.

MATERIALS. Accessory parts required for the installation should be furnished with the decking.

Generally, deck units will be provided with end laps of at least 2 in. occurring over supporting joists. Side laps will be made by interlocking ribs.

Units are generally furnished prefabricated to fit the joist spacings and the areas to be covered, with minimum fabrication to be done on the job. The contractor will

have to cut odd plates as may be specified on the erection drawing or as may be required in the field for proper installation and to complete the job.

INSTALLATION. Deck materials must be installed in accordance with the erection drawings which will be furnished to the contractor by the manufacturer of the deck.

Decking should be installed with ribs down, over steel or other support members, to provide a complete and continuous deck plane to receive insulation and roofing. The entire upper portion of the deck shall provide an even and smooth surface, except for increased thickness caused by end laps.

It is most important that the decking be securely fastened in place at ends, sides, and intermediate points (by welding if attached to steel) in accordance with standard practice and manufacturer's specifications.

Generally, fastening to steel by welding is done through the bottom of the ribs to all structural supports, at maximum spacing of 12-in. centers. The best end joints are made when one end of the sheet is die set and the next sheet lapped over it. If the sheets are butted, then the joints should be taped to check flow-through of asphalt at these points.

A good job requires that support be provided at all points so there is no give anywhere, also that closures be installed so there will be a solid plane for support of insulation and roofing.

GENERAL SHEET METAL WORK

SCOPE. General sheet metal work hereunder shall include the following work for the warehouse: wall louvers (flashing in connection with sandwich walls is included under Metal Wall Siding and Roof Ventilators), and the following work for the office building: All ventilating louvers in boiler room walls; flashing above cant strips; gravel stop edge strips on entrance roof and storm vestibule; roof curb flashing at ventilating air intake; all stainless steel facing and column for entrance roof; and closures at roof deck edges.

MATERIALS. For many years man has used lead, copper, zinc, black steel, and galvanized steel in sheet metal work. Lately, stainless steel and aluminum have been added to this list. On this job we say all sheet metal shall be No. 302 stainless steel, 26 gage, unless otherwise specified, in No. 2B finish unless otherwise shown.

GRAVEL STOPS. Sheet metal gravel stops should be provided on the roofs of the entrance and the storm vestibule, as detailed on the plans. This main roof has parapet walls on all sides, and no stops are needed.

FLASHINGS. Sheet metal cap flashings should be installed on the roof sides of the parapet walls and the chimney to give a watertight joint to the roofing.

These flashing members at the masonry walls should be formed with top edge flanges about 1 in. wide, for cementing into raggles. The vertical faces should be of varying heights to conform with the roof pitch and the brick joints. The bottom edges should be hemmed and turned out in lines even with tops of cant strips.

Ends should be lapped at least 4 in. This flashing should then be securely anchored to the walls with stainless steel hook nails driven into mortar joints. The metal in the raggles should be cemented with best quality fibered asphalt roofing cement.

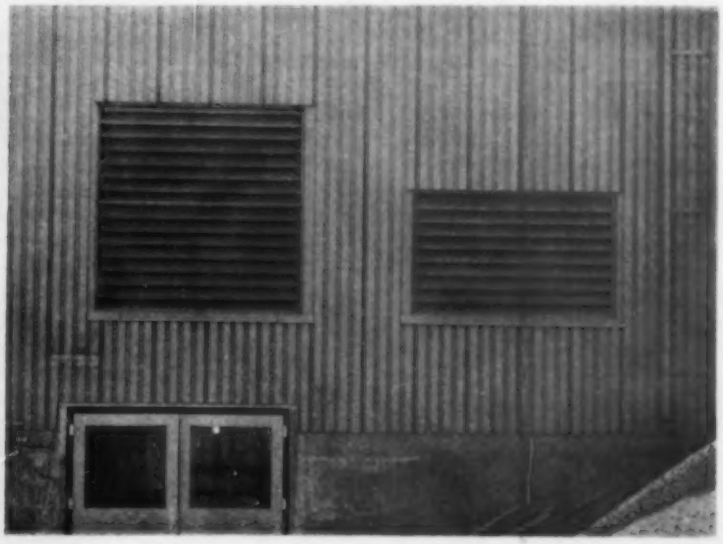
SHEET METAL LOUVERS. Part of this contract is the fabrication and installation of sheet metal louvers, as indicated on the drawings, in walls of the warehouse and boiler room.

A bird screen should be provided in each unit, made of 12 gage stainless steel wire, woven to produce a ¾-in. mesh, securely and rigidly attached to a 1-in. formed stainless steel channel. The completed screen frames should then be bolted to the louver frames.

ROOF DECKING CLOSURE. Where the curbs for ventilating system occur, the contractor must provide sheet metal closure angles as detailed on plans. **End, Part V**

Fig. 4. When building has parapet wall such as this, flashing is set into raggles, folded over gravel stop.

Fig. 5. Sheet metal contractor may be responsible for fabricating and setting metal louvers into building walls.



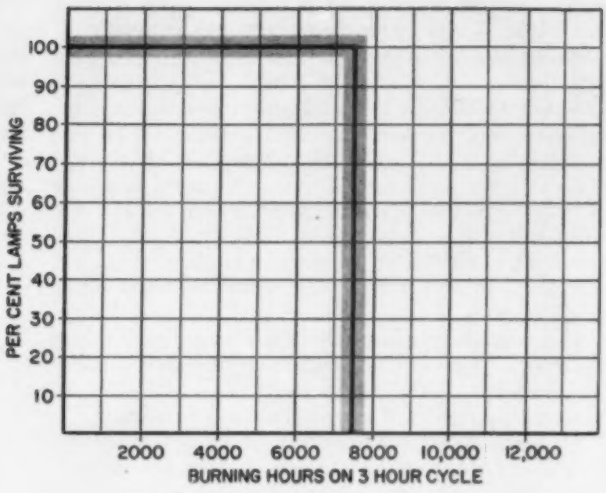


Fig. 1. Mortality curve for theoretical lamp in which all lamps of a large installation fail at exactly the same time.

THROW THOSE LAMPS AWAY!

By **WILLARD ALLPHIN**, Illumination Research
Sylvania Electric Products, Inc., Salem, Mass.

MANY PLANT ENGINEERS are still passing up substantial savings that could be made possible by installing a group relamping program in their plants. The greatest stumbling block is probably a natural reluctance to throw away a lamp that is still functioning. Actually there are many things we discard before useful life ends. Some common examples are razor blades, automobile tires, spark plugs, motor oil and flashlight batteries. In each case, a new item is installed to restore efficiency and reliability to original levels.

We are not suggesting that you throw away a good lamp. The lamp we are asking you to discard has used up 80 per cent of its useful life and has depreciated to a very low cash value. Depending upon the type of lamp in use, it will only produce 65 to 85 per cent of the light output of a new lamp although it consumes almost the same amount of power. If I offered to sell you a lamp with these characteristics, you probably would not accept it as a gift.

The concept of group relamping would be easier to visualize if a new type of lamp could be developed in which all lamps of a large group would fail at exactly the same time. The mortality curve for this theoretical lamp would look something like the curve in Fig. 1. I think we can safely assume most plant engineers would schedule a complete relamping just before all lamps failed. In real life, however, such absolute uniformity would be impossible.

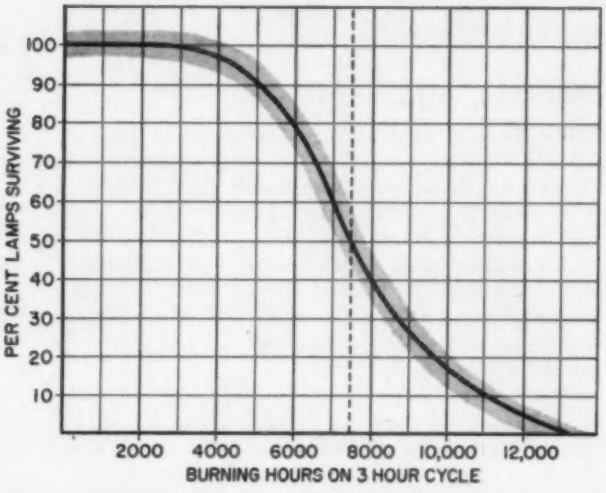


Fig. 2. Actual mortality curve for fluorescent lamps. Some lamps burn out before rated life and some will last longer.

An actual mortality curve for fluorescent lamps looks like Fig. 2. Some lamps burn out before average rated life and some last longer. At rated life, approximately one half of a large batch of lamps will have failed.

Although this curve is not nearly as square as the theoretical lamp, it does have a pronounced bulge in the right direction. We can gain many of the advantages of the perfect lamp by taking full advantage of this bulge in the mortality curve.

One problem is to determine the point at which we have extracted the maximum life from the lamps without running into excessive lamp failures. Most lighting experts agree that the point representing 80 per cent of normal lamp life is a good place to consider group relamping.

As burning hours are sometimes difficult to judge, an easier method bases the replacement time on lamp fail-

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ALCOA
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Circle 574 on postcard, page 33

ures rather than per cent of life. In a typical large group of lamps, when 20 per cent of the lamps have failed, you have reached 80 per cent of lamp life.

In practice this is easy to apply. When a given area in your plant is equipped with new lamps at the start of a group relamping program, simply purchase 20 per cent more lamps and set the additional ones aside in the stockroom. Replace early failures from this stock and when the 20 per cent have been used up, it is time to make another group replacement.

In Fig. 2, we can see that this point, which leaves 80 per cent of the lamps surviving, occurs at about 6000 hours. This is 80 per cent of the normal lamp life of 7500 hours. If the burning cycle is six hours per start, average rated life will be about 10,000 hours. The average 80 per cent survival figure will still be reached at about 80 per cent of life or 8000 hours.

New lamps which are used for spot replacement in the latter part of the group replacement period can be marked with a grease pencil and saved when the other lamps are removed and destroyed. The marked lamps can then be used for spot replacements in the next cycle.

Some plant engineers use their own maintenance men to make the group replacement, employing equipment specially designed to make the large scale operation easy. Other firms use outside maintenance contractors except for spot replacements of early failures.

Maximum savings are obtained when the group relamping is scheduled to coincide with one of the periodic fixture cleaning operations. It takes about the same length of time to install a new lamp in a fixture as it would take to clean and re-install the old lamp. On this basis, the new lamps can be installed with no additional labor charge assigned to the group relamping analysis.

A further clue to the money-saving advantages of group relamping is furnished by the many small organizations specializing in lighting maintenance. These companies usually work on a contract basis and the difference between profit and loss depends upon how economically they maintain the system. It is interesting to note that these organizations always replace lamps on a group basis.

A simplified form for predicting the savings possible by group relamping is shown in Fig. 3. In this study, two men take 20 minutes to spot-replace a lamp and three minutes to group-relamp, labor is $2.40 per hour, there are 1500 lamps in the installation and net lamp cost is $0.75 each.

Make Your Own Analysis

It is obvious that major savings are made in the labor cost of group relamping versus spot relamping. Make your own time study of these two methods of relamping to determine actual costs. Set aside two areas in your plant for a study of one system over the other. In addition to substantial savings in labor you will enjoy with group relamping, you probably will be pleased with the better over-all appearance of the lighting in the area using group relamping. **End**

"One at a Time" Lamp Replacement		Group Replacement (At 80% of Rated Life)	
A. Labor Cost:		A. Labor Cost:	
Man-Minutes per Call x Hourly Rate x Number of Lamps		Man-Minutes per Lamp x Hourly Rate x Number of Lamps	
$2 \times \frac{20}{60} \times \$2.40 \times 1500$	= $2400.00	$2 \times \frac{3}{60} \times \$2.40 \times 1500$	= $360.00
B. Lamp Cost:		B. Lamp Cost:	
Number of Lamps x Net Price per Lamp		Number of Lamps x Net Price per Lamp	
1500 × $0.75	= $1125.00	1500 × $0.75	= $1125.00
		C. Additional 20% charge for individual replacements as they occur (20% of Labor Cost A at left)	= $480.00
		D. Add A + B + C for group cost if GR is made at 80% of rated life	= $1965.00
Total "One at a Time" Cost (Add A & B)	= $3525.00	Total Group Replacement Cost (Multiply D x 1.25 to adjust for full rated life)	= $2456.25

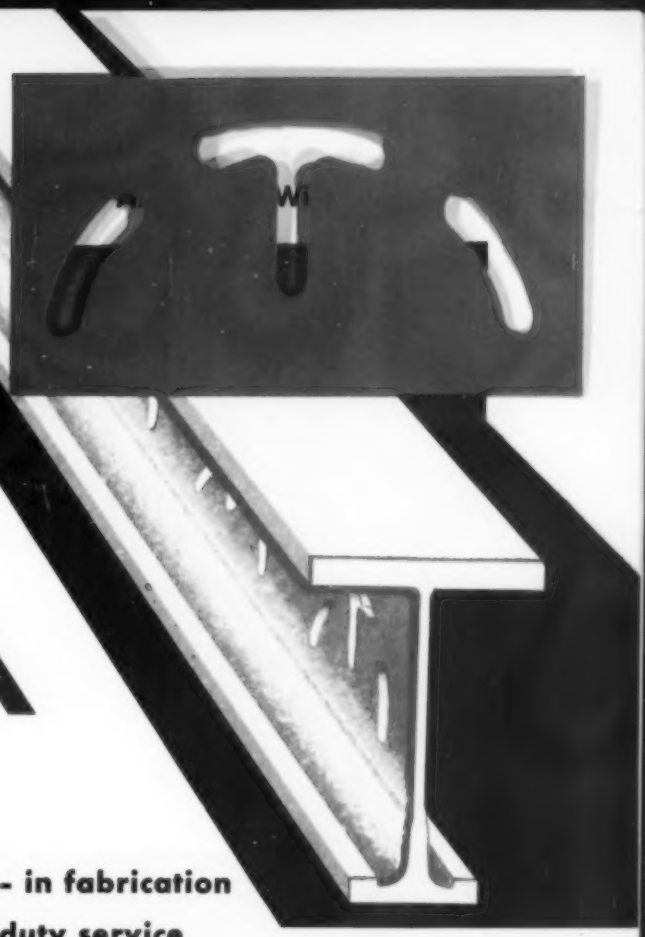
Typical Savings for Your Installation:
With "One at a Time" Lamp Replacement, you are spending $3525.00
With Group Replacement, you spend only $2456.25
YOU SAVE $1068.75

Fig. 3. Predicting savings possible by group relamping. Two men are used, earning $2.40 per hour, there are 1500 lamps in the installation and net lamp cost is $0.75 each. Make your study by inserting figures that apply to your plant.

Circle 525 on postcard, page 33 ➔

A NEW
HEAVY-DUTY OVERHEAD TRACK BY CLEVELAND TRAMRAIL

TARCA TRACK



- **Completely new - - in design - - in fabrication**
- **Assures more years of heavy-duty service**
- **Great rigidity** ■ **Maximum strength with minimum weight**
- **Design readily proportioned to suit any load condition**
- **Overcomes track peening** ■ **Greater range of sizes**
- **New support fittings expedite erection**

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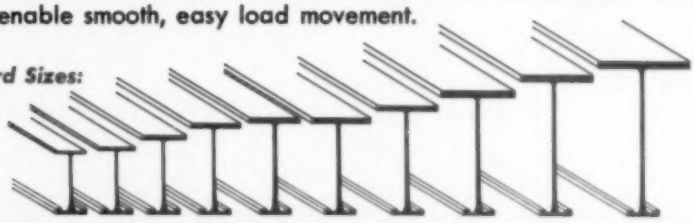
Cleveland Tramrail Tarca Tracks are a tremendous innovation in the overhead materials handling field. Another great improvement among many by Cleveland Tramrail to keep it far in the lead.

Tarca Tracks are straight, true, accurate—have flat raised treads—of hard, high-carbon alloy steel—prevent peening—provide greater wear resistance—enable smooth, easy load movement.

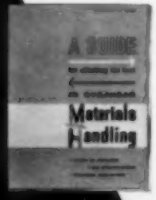
10 Standard Sizes:



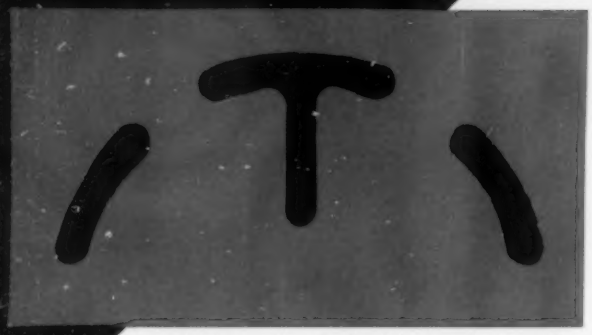
Sizes range from 8″ to 20″. Also special sizes are easily made to suit any overhead crane or monorail requirement. Tarca Track matches with existing Cleveland Tramrail track installations.

Ask for this helpful booklet—No. 2032

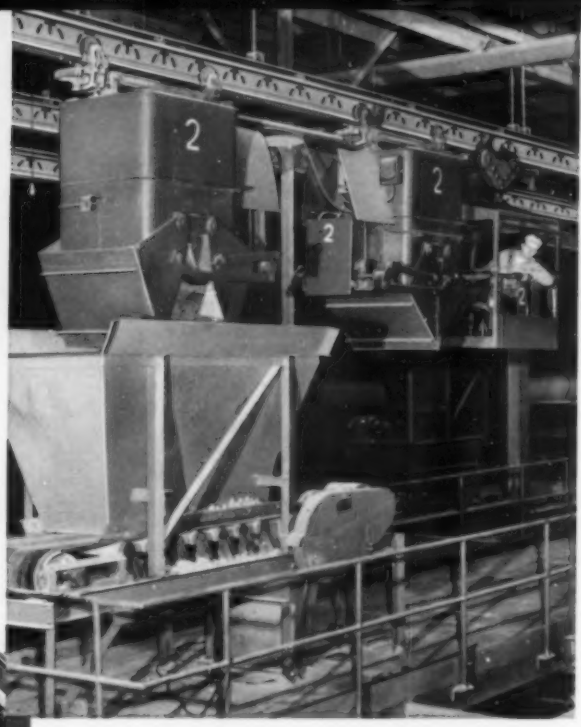
Covers all major features the buyer should know about overhead materials handling equipment. Has complete story on Tarca Track. Contains detailed equipment specifications and handy proposal evaluation form.



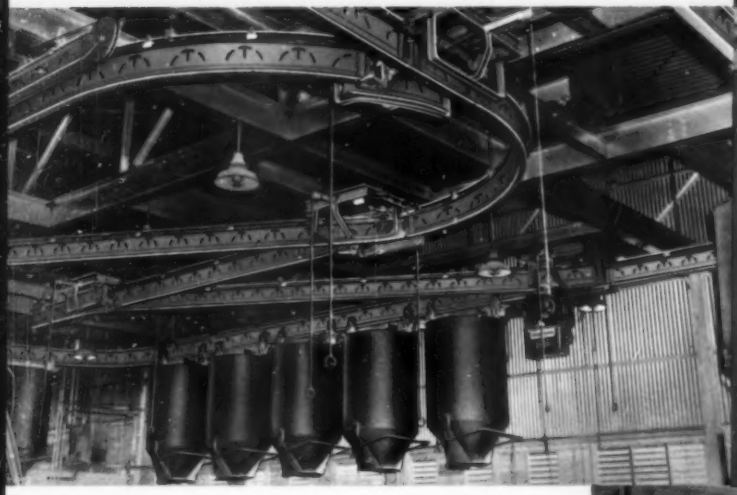
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO
5899 EAST 284th STREET · WICKLIFFE, OHIO



Trade—mark of durability and strength —punched into all Tarca Tracks.

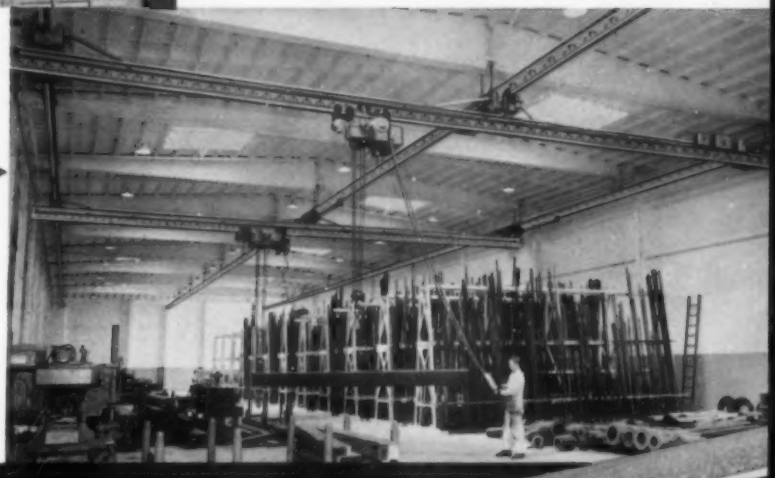


Cleveland Tramrail has an enviable reputation throughout the Ceramic Industry for outstanding performance. Customers have reported that their installations subject to heavy, continual usage are serving them far beyond expectations. ▶



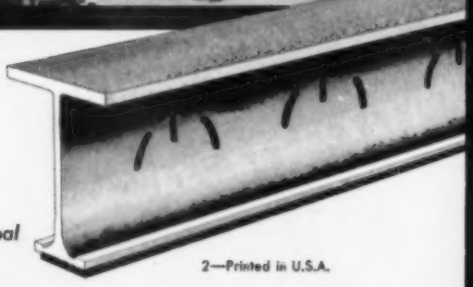
◀ In the Glass Industry Cleveland Tramrail advanced a method of handling mixed ingredients in buckets traveling between mixer and furnaces which prevents segregation. This has proven so successful in assuring uniform quality that today the entire production of many glass plants is dependent upon equipment like that illustrated here.

Cleveland Tramrail floor-operated cranes ▶ are such an important factor in handling heavy materials and cutting costs that there are now thousands of installations serving factories, mills and warehouses. Tarca Track is of real advantage for crane systems because of its great resistance to deflection.



Your Cleveland Tramrail Sales Engineer is Qualified to give you the Complete Design and Application Story on This Revolutionary

NEW TARCA TRACK



Cleveland Tramrail is represented by competent, experienced engineers in all principal cities of the United States and Canada. Contact address on other side.

2—Printed in U.S.A.

Equipment Goes Vertical for Insulating Copper and Aluminum Wire

EXTENSIVE NEW equipment at Kaiser Aluminum & Chemical Corporation's plant in Bristol, R. I., provides the company with one of the world's most modern facilities for insulating copper and aluminum electrical conductors.

Known as a vertical continuous vulcanizer, it reportedly represents the tallest and largest machine of its type in existence.

Natural and synthetic rubber insulating materials are extruded around preheated conductor at the top of the 126-ft tower and cured in a vertical 75-ft long steam vulcanizing tube. The cable then continues through a water cooling tube at the same pressure to improve density of the insulating material.

After traveling vertically, the insulated cable turns on a capstan and is cooled further in a horizontal 65-ft water tube before being sent to a takeup reel at ground level, completing the operation.

This facility will be used for insulating and curing portable cables, building wire and power cables up to 3½ in. in diameter and 3000 ft long, rated from 600 to 15,000 v.

Crane Bridge Spans 300 Feet To Serve Ore Storage Yard

ENLARGED ORE STORAGE facilities at the Ashland, Kentucky, works of Armco Steel Corporation are served by a recently-completed, 15-gross-ton man trolley ore bridge.

Designed and erected by Dravo Corporation, the stocking and reclaiming bridge was installed as part of an expansion program that made it necessary to raise the ore yard's storage capacity for ore and pellets from 650,000 cu yd to 1,050,000 cu yd.

Size of the new bridge was determined by the widening of the ore yard from 185 ft to 300 ft. Over-all length of the structure is 379 ft, with a 300-ft span. The man trolley and its 250-cu ft bucket, which rack back and forth at a speed of 900 ft per minute, ride on rails 90 ft above the base of the ore pile. Hoisting speed of the loaded bucket is 260 ft per minute and travel speed of the bridge is 83 ft per minute.

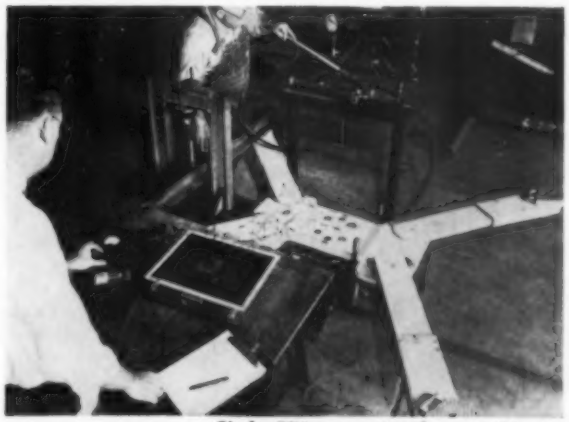
Legs, trucks, trolley and equipment houses of the bridge are of welded steel construction. Four spring-set, hydraulically-operated Dravo rail clamps, one for each of the four rails, provide a major safety factor, automatically engaging when wind velocity reaches 35 miles an hour or if power fails. These clamps hold the bridge firmly in winds of more than 100 miles an hour.

Driven by adjustable voltage d-c motors, the bridge operates from a high-voltage a-c power supply. Motor generator sets are mounted in a house on the pier leg.

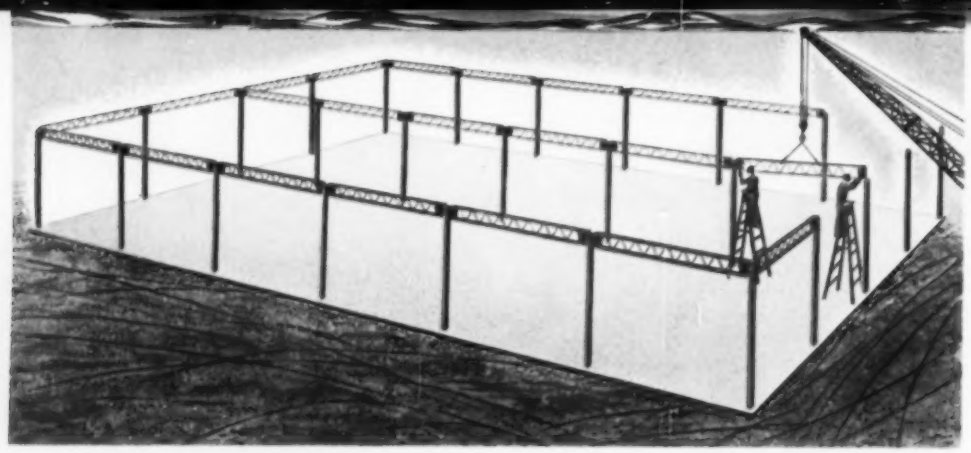
Strain Gage Tests Safety Factor of Automotive Lifts

TINY STRAIN GAGES help to guaranteed the safety of many automotive hoists which lift your car for servicing in garages and service stations throughout the country. The strain gage testing procedure is employed by Globe Hoist Company to assure that its 8000-lb lifting capacity hoists meet federal and state structural and manufacturing standards and to determine feasibility of new design lifts. It is also used to measure the effects of changes made on existing lines.

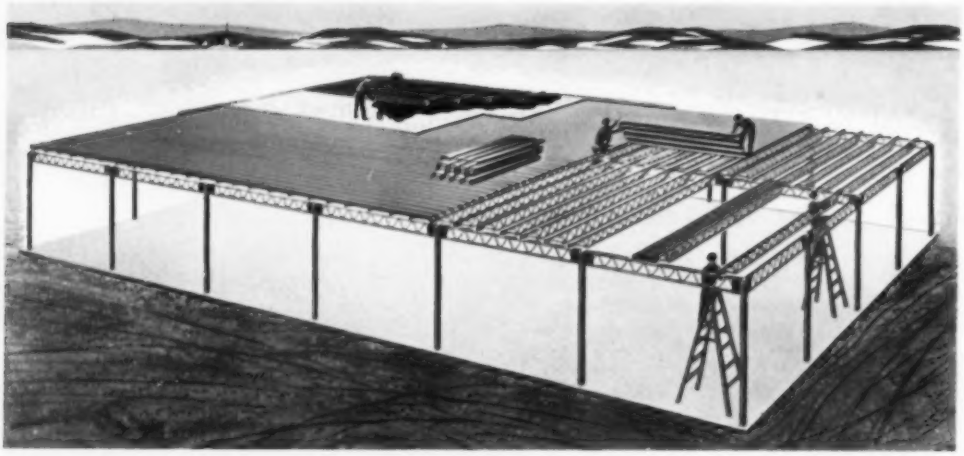
The strain gages used are SR-4 units produced by the Electronics & Instrumentation Division of Baldwin-Lima-Hamilton Corporation, Waltham, Mass. Use of these gages eliminates the previously used destructive method of testing, where the hoist was loaded past the yield point to determine reaction to loading, and provides a means for determining strain continuously under conditions imposed by varying amounts of applied load. (Continued on page 160)



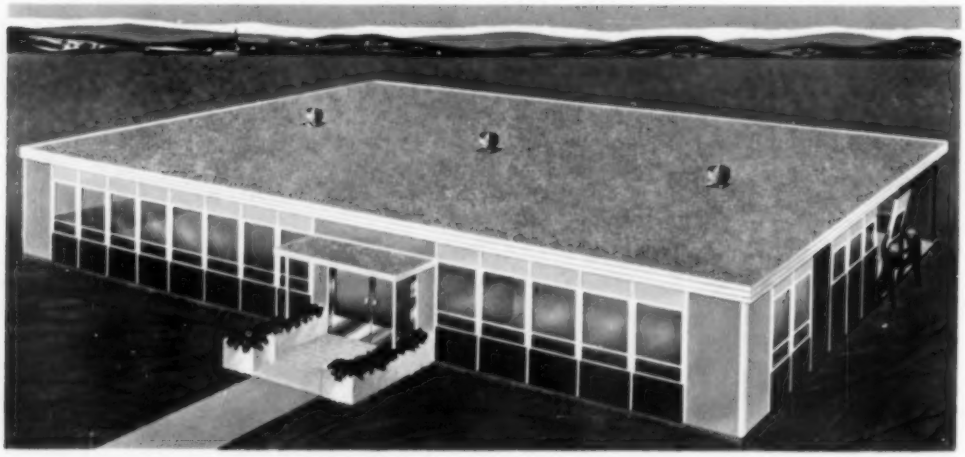
Circle 576 on postcard, page 33 ➔



A sturdy frame . . .



A simple roof . . .



Slim, colorful panels . . .

AmBridge Modular Construction for distinctive, handsome buildings that go up quickly

This mark tells you a product is made of modern, dependable Steel.

Steel has always meant strength
Architecturally, steel is much more

Today's steel is more strength than your dollar can buy in any other material. It is many extra feet of floor space because steel walls don't have to be thick to be strong. It is days saved in construction time and it's weather-proof—can be handled in any season, anywhere. It is colorful panels and gleaming mullions that help clean themselves. It is skyscrapers and schools, churches and commercial buildings because it is the architect's most versatile material for design.

Take USS AmBridge Modular Construction. The light, sturdy steel frame can be erected by a few men in a few days. Add a few more days for the simple roof, complete with supporting joists that accommodate and conceal piping and ductwork. Add a splash of color with tough, space-saving steel wall panels—and get walls with fine thermal and acoustical values in the bargain. They are available in 81 different colors and five finishes.

USS AmBridge Modular Construction permits distinctive architectural design, long-term economy and satisfaction. Have you ever put all the qualities of steel to work for you? Write for our new booklet for complete information.

USS and AmBridge are registered trademarks

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American Bridge Division of United States Steel

New Annealing Process Eliminates Need of Enameling Ground Coat

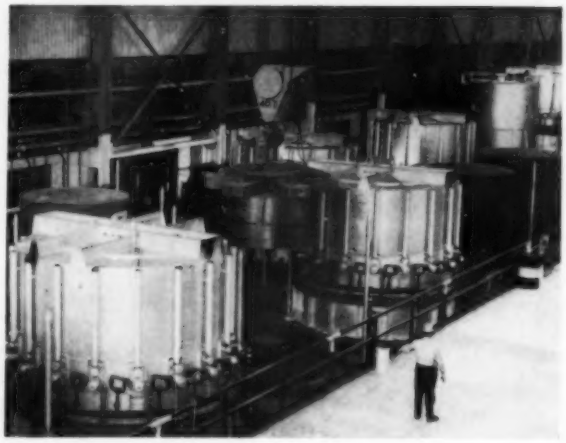
EIGHT LARGE annealing furnaces for the production of vitreous enameling steel sheet have been installed at the Lackawanna plant of Bethlehem Steel Company.

The enameling steel, Bethnamel, has properties which permit a finish coat of enamel to be fired directly on it, making it possible to eliminate the ground coat of enamel.

Production of steel by means of an open coil annealing process involves changing its chemistry by exposing the surface of a coil to special annealing gases. The object is to reduce the carbon content, making the steel more ductile.

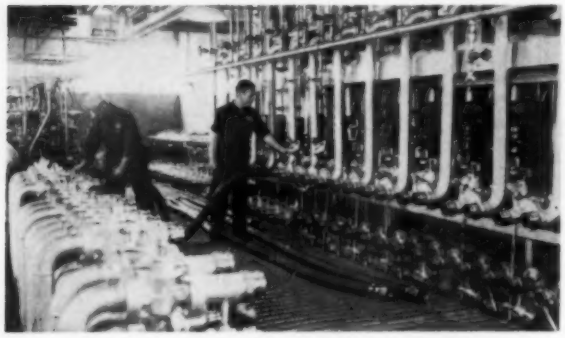
The coils are placed in the annealing furnaces for heat treatment which employs 1300 F as the decarburizing temperature. The secret of removing carbon without oxidizing the steel was to admit steam into the sealed furnace, along with a mixed gas consisting of 18 per cent hydrogen and 82 per cent nitrogen.

After a purging process, the decarburized steel is tight-wound and given a final skin pass rolling.



Electronic Controls Automate Lubricant Blending

RUN BY FULLY automated electronic controls, the nation's first lubricating oil blending plant is being operated at River Rouge, Michigan, by Texaco, Inc. The multi-million-dollar facility will blend and compound more than 40 types of consumer and industrial oils.



Central feature of the plant operation is an electronic control console which enables a technician to mix automatically as many as six additives and base stocks at a time.

The high-speed plant is expected to provide special advantages for industrial firms requiring fast delivery of specialty lubricants made precisely to specifications.

The plant will receive deliveries of base oils in bulk from ocean-going tankships. Tank storage capable of holding 300,000 barrels of stocks forms a major part of the plant.

The electronic control console, blending equipment, and kettles are located on the second floor of a two and one-half story building. Proper connections are made to the blender pumps and to the desired delivery point in the plant, and controls set for precise percentages of each component and the desired total quantity of finished lubricant. The fully automated blender—the only one of its kind—is then turned on. After blending and compounding, finished lubricants are pumped directly from the automatic blender to a barrel-filling line on the ground floor, stored in compartmented tanks indoors, or routed to loading racks for tank trucks and tank cars.

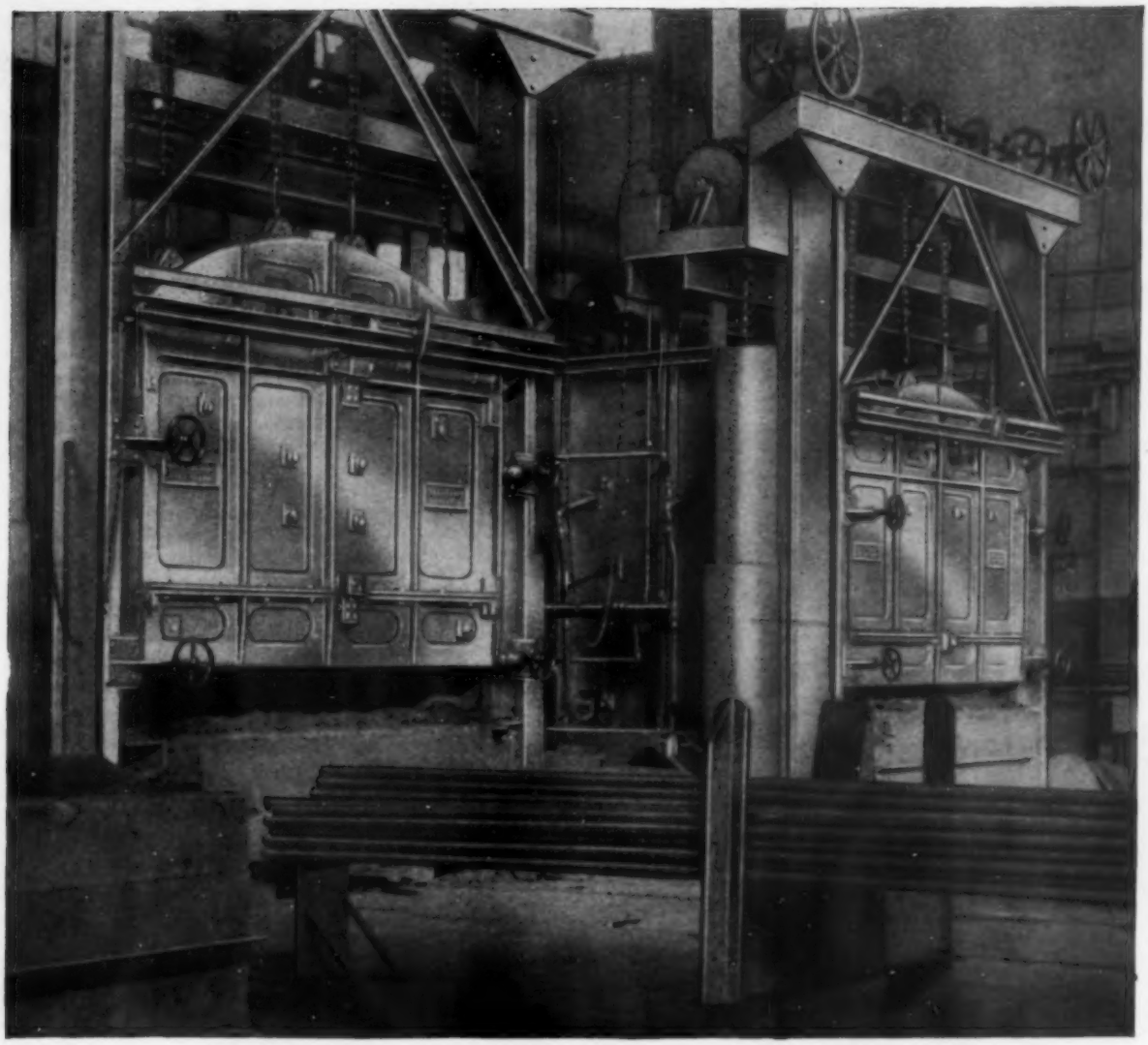
Unusual Conveyor Design Teams Wire Rope and Prestressed Concrete Beams

THE PROBLEM of supplying a concrete mix plant with sand and crushed stone from a quarry across a well-traveled highway was solved by an ingenious combination of one of the most modern of construction materials—prestressed concrete—and the newest in conveying systems—wire rope.

C. W. Blakeslee & Sons Company of Hamden, Connecticut, fabricated a T-shaped concrete beam—276 ft long in two sections, 8 ft wide, and 3 ft deep. The beam was then installed across a highway, connecting the company's source of aggregate with its ready-mix plant, rising at a 15-degree slope to a height of 87 ft.

A Hewitt-Robins wire rope conveyor, 30 in. wide, was positioned on top of this concrete "bridge", erected on three clusters of four concrete-filled steel pipes.

Idler spacing is 5 ft for troughing, 15 ft for returns. The final 40 ft is 42-in. deep truss, to keep the weight of the concrete beam off the supply bins. The system was designed to handle various size aggregates.



paint on "minimum maintenance"

The Finest Paints Made with Aluminum are made with REYNOLDS ALUMINUM PIGMENT

Aluminum paint prevents rust and corrosion... provides superior heat protection

Aluminum flakes rise to the surface of a coat of aluminum paint—forming a solid metal shield that moisture and corrosive gases just can't penetrate. Decay and deterioration are drastically reduced. And paint made with Reynolds Aluminum Pigment holds heat in, increases efficiency. It's the coating that puts a *metal shield* over any surface. *Reynolds Metals Company, P. O. Box 2346-PL, Richmond 18, Virginia.*

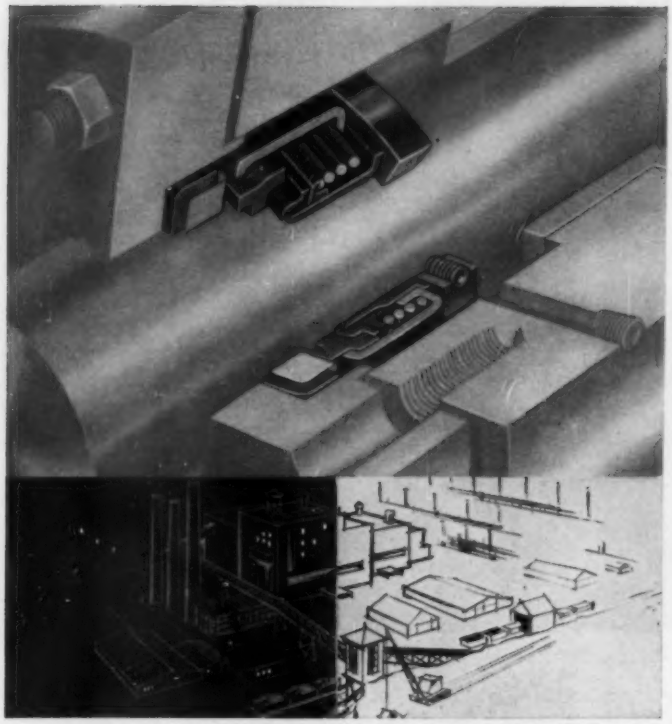
REYNOLDS ALUMINUM

Watch Reynolds exciting TV programs on NBC: The Dick Powell **Reynolds Aluminum Show** every other Tuesday; **Say When**, weekdays; **All Star Golf** — in living color — every Saturday.

Circle 577 on postcard, page 33

ENGINEERED PRODUCTS

for Plant Maintenance



Garlock PK MECHANIPAK Seals work night and day to stop leakage, reduce downtime, and cut maintenance costs on centrifugal pumps and similar equipment.

For 'round the clock prevention of leakage on rotary shafts, apply Garlock PK MECHANIPAK® Seals.

Specified as standard by many industrial companies and utilities, Garlock PK MECHANIPAK Mechanical Seals also help protect equipment from failure in many high temperature applications.

Plant engineers and maintenance personnel enjoy the ease with which Garlock PK MECHANIPAK Seals are handled and installed. A self-contained "package" unit, the seal has no parts that must be put together. The rotating portion simply slides onto the shaft; the stationary portion positions quickly into the counterbore of the gland. Once the Garlock PK MECHANIPAK is installed, further adjustment is unnecessary. No parts of the seal move on the shaft or sleeve, eliminating wear to these parts. A spring in the seal maintains contact between sealing faces, thus assures leak-proof operation.

To meet the various application conditions encountered on centrifugal pumps and similar equipment, Garlock PK MECHANIPAK Seals will operate at pressures to 150 p.s.i., and in temperatures as high as 212° F with Buna-N bellows . . . above 212° F with fluid at faces and Viton† bellows. The standard seals can be applied on shafts from ⅜" to 3" in diameter, with speeds up to 2000 f.p.m. and are available for "off-the-shelf" delivery. Garlock PK MECHANIPAK Seals will work effectively against water, oils, alcohol, mild acids and solvents. Where application conditions are more extreme (i.e., higher temperatures, shaft speeds, or pressures) Garlock PK MECHANIPAK Seals are available in several different materials, each suited to a particular requirement.

For the complete story, get in touch with the Garlock representative in your area. Call him at the nearest of the 26 Garlock sales offices and warehouses throughout the U.S. and Canada. Or, write for Catalog AD-150, Garlock Inc., Palmyra, N.Y.

GARLOCK

Canadian Division: Garlock of Canada Ltd.

Plastics Division: United States Gasket Company.

Order from the Garlock 2,000 . . . two thousand different types of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*Registered Trademark
†DuPont Trademark

Circle 725 on postcard, page 33

KNOW YOUR SYMBOLS

This symbol stands for bus duct

This symbol stands for QUALITY

NOW... BullDog plug-in duct hangs up to 50% faster

with new HANGFAST Adapter

New HANGFAST Adapter bolts quickly and tightly to suspension rod end . . . duct with standard hanger engages HANGFAST Adapter hook instantly . . . hanger bolt spins tight fast for a lasting, secure installation. Result—you can save as much as 50% in hanging time . . . end time-consuming bracket fabrication, too! And you can use the new HANGFAST Adapter with all types of BullDog industrial plug-in duct systems—XL, BD and LO-X®. Ask your BullDog Field Representative for a demonstration. Or write for details.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Mich. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St. New York 16, N.Y

I-T-E CIRCUIT BREAKER COMPANY

BULLDOG ELECTRIC PRODUCTS DIVISION

Circle 578 on postcard, page 33

Youngstown Foundry & Machine cuts heating cost

Startling savings of $9,892 in fuel costs in one year's operation – plus a wonderful new kind of heating comfort – are big reasons Perfection Schwank *Gas* Infra-Red Heaters rate high with Youngstown Foundry and Machine Company, Youngstown, Ohio. Listen to these comments:

"Heating a 60 year old building like this is a tough job," states James Paumier, Plant Superintendent, "but this Perfection Schwank *gas* system gives us a constant and comfortable 65° temperature, drastically cuts our fuel cost and requires practically no maintenance."

Wayne Thew, Foreman, exclaims, "I've been here for 20 years and Perfection Schwank *Gas* Infra-Red is far superior to any other heating system we've tried. Castings and machinery are *always* the same temperature, eliminating expansion and contraction problems and making

Circle 579 on postcard, page 33

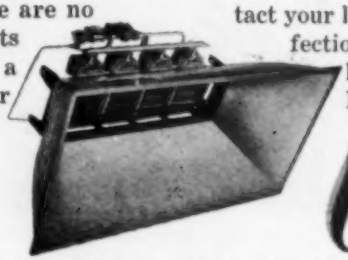
Part of the 41,160 square feet of floor space at Youngstown Foundry and Machine . . . all heated by Perfection Schwank Gas Infra-Red Heaters.

$9,892 with Perfection Schwank Gas Infra-Red Heaters

tolerances much easier to meet."

States Joseph Sagy, Plane Operator: "Since we've had these *gas* Infra-Red heaters, there are no drafts, no hot and cold spots . . . in every way they're a big improvement over our previous heating system.

Perfection Schwank *Gas* Infra-Red Heaters give you all of the advantages of modern *gas* heat—high efficiency . . . precise control . . . speed . . . safety . . . cleanliness . . . economy . . . as well as dependability of supply.



Heat better for less with Perfection Schwank *Gas* Infra-Red Heaters. For complete information, contact your local Gas Company or write to Perfection Division of Hupp Corporation, licensee of American Infra-Red Radiant Co., 1135 Ivanhoe Road, Cleveland 10, Ohio.

American Gas Association.

FOR INDUSTRIAL HEATING GAS IS GOOD BUSINESS!

Approved by A.G.A., Underwriters, C. G. A. and C. S. A.
Under Schwank U. S. Patents 2,775,294 and 2,870,330 and pending applications.

EXPLOSION PROOF FIXTURES

Class 1, Groups C and D

Class 2, Groups E, F, and G

Special inner reflector plays important part in excellent lighting efficiency. Pendent, ceiling, bracket and flush mountings. Shockproof, heat-resistant annealed globe. 60 to 500 watt.

Mercury Vapor

Mercury Vapor light fixture for hazardous locations. Two basic sizes, accommodating 250 and 400 watt mercury vapor lamps. Pendent, ceiling, bracket or flush concrete mounting types. Copper-free aluminum castings, steel porcelain enamel reflectors of various types. Clear globes available in smooth, or fluted or prismatic style.

Class 1, Groups A and B

Light fixtures for use in Class 1, group A (acetylene) and group B (hydrogen) hazardous locations. Pendent, ceiling, bracket and concrete mounting types; openings for ½", ¾" and 1" conduit; various types of steel porcelain enamel reflectors, accommodating 150 watt and 200 watt lamp sizes. All cast parts are copper-free aluminum.

SPECIAL LOCATIONS

Flood light

Weather proof in any position. Styles for PAR-56 and PAR-64 sealed beam lamps.

Sealed beam light

Variety of single or cluster styles, adjustable mountings. Sealed against weather. PAR-38 and R-40 lamp styles.

Conch Light

Many applications—indoors or outdoors. Attractive fleur-de-lis design. With or without switch.

Dekorative light

Gives added beauty. Pendent or ceiling mounting, frosted or clear globe. 60-100 and 150 watt lamps.

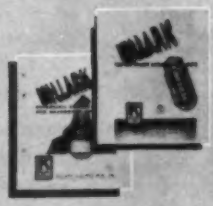
Louver light

For steps, passageways, small signs. Easily installed and serviced.

Mushroom island light

Basic island light, plus one to five sealed beam spot lights, as required. Ideal for service stations, parking lots, etc.

Write for the Killark lighting catalogs.



Killark

ELECTRIC MANUFACTURING CO.

Vandeventer and Easton Ave. St. Louis 13, Mo.

In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

DUST TIGHT

Approved light fixtures for use in Class 2, Groups E, F, G hazardous locations. Vertical design keeps dust from accumulating, close fitting parts keep it from entering fixture. Coolest burning dust-tight lights mean added safety. 100 and 150-300 watt sizes.

VAPOR TIGHT

The Killark line has vapor-tight light fixtures for every outdoor or indoor need. Design simplicity and interchangeable parts make these lights easy to install and service. Positively weather-proof. Pendent, ceiling, bracket mountings 60 to 500 watt.

FIXTURE HANGERS

Rubber-cushioned, vapor-tight fixture aligners for pendent fixtures. Flexible, shock-absorbing, easy to install.

Explosion-proof fixture hangers for pendent fixtures, Class I, Groups C and D, Class II, Groups E, F, and G.

6132

Wherever protected illumination is needed...

KILLARK LIGHT FIXTURES SERVE WITH DEPENDABILITY

"Les Sparks"

A complete line of industrial and commercial lighting fixtures allows Killark to serve all types of installations with proper protected lighting. The Killark ability to supply exact needs means maximum safety, convenience, and efficiency—for both hazardous and non-hazardous locations.

All Killark fixtures are cast from aluminum to provide important extra advantages. Installed inside or outdoors, they remain permanently rust-proof. They give outstanding service in many areas where corrosion is a problem. Aluminum also dissipates heat at a much faster rate, and is safer because it's non-sparking.

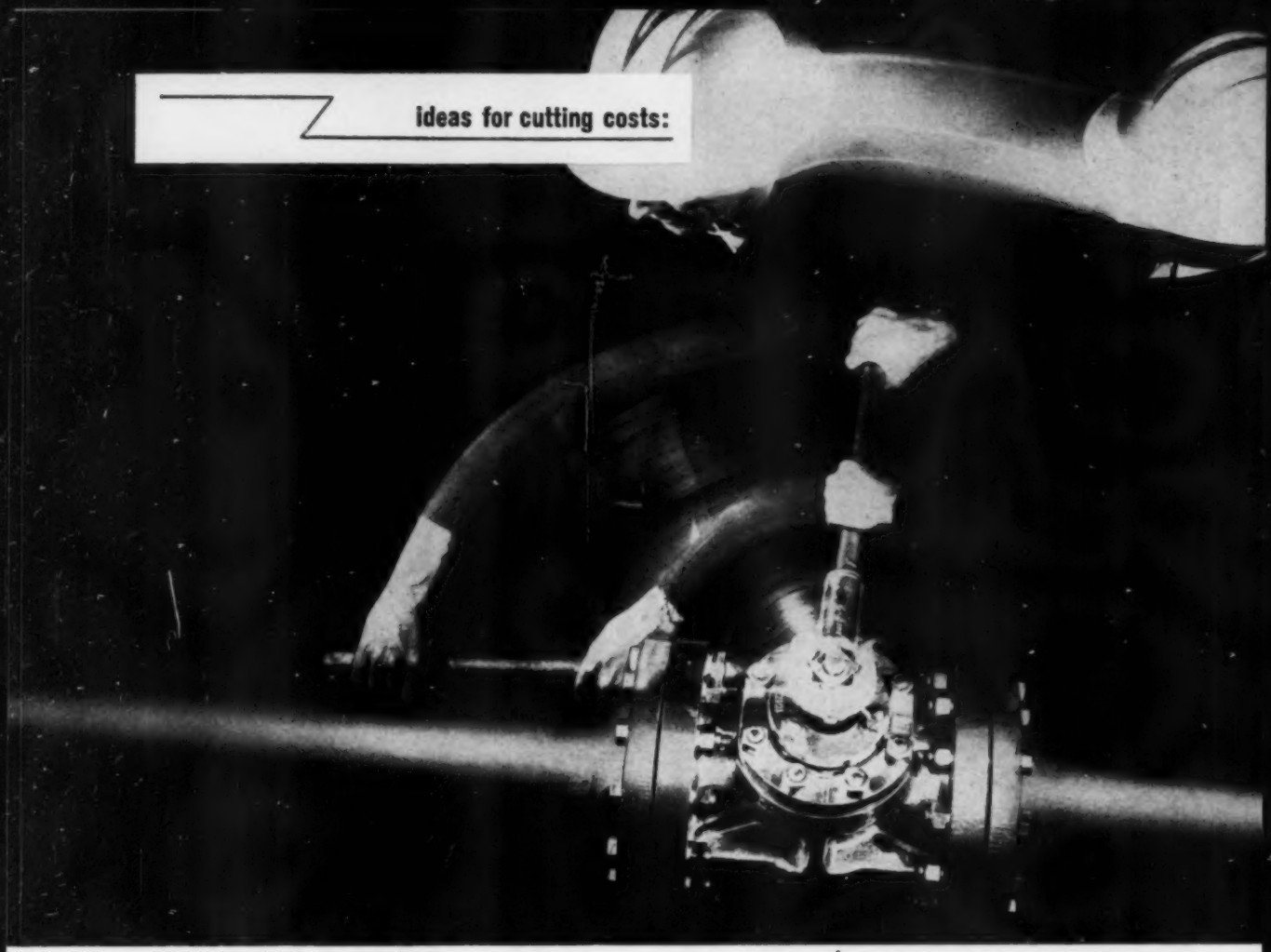
Simplicity of design is still another reason for the superior performance of Killark light fixtures. Most styles have interchangeable parts to allow quick, inexpensive changes in mounting method, wattage capacity, type of globe, or reflector. Relamping can be done easily without tools.

Your Killark dealer can supply these fine light fixtures promptly—from his stock or one of the nineteen Killark warehouses in the United States and Canada.

Killark light fixtures are U.L. and C.S.A. approved.

Circle 580 on postcard, page 33

ideas for cutting costs:



SAVE MONEY ON TOUGH SERVICES WITH QUARTER-TURN LUBRICATED PLUG VALVES

You'll get a big bonus of longer life and bottle-tight shut-off with Rockwell-Nordstrom lubricated plug valves. Fully protected seats and dependable operation assured by lubrication mean superior performance on difficult services—pickling acids, caustics, slurries, etc. On other and easier services, you will also benefit, since Rockwell-Nordstrom valves cost no more than non-lubricated valves and in some instances less. They open or shut quickly with a quarter turn of the wrench.

There are literally hundreds of ways Rockwell measurement and control equipment is helping manufacturing and processing plants save time, money and materials. The experience of the world's largest single manufacturer of valves, meters, regulators and other equipment for measurement and control can pay off for you, too. Wherever liquids or gases flow through pipes in your plant there is a real opportunity for savings. It will cost you nothing to get the facts . . . Simply send the coupon.

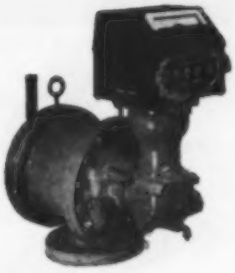
ROCKWELL

The leading single source for Measurement / Control products and ideas

"IN-PLANT" METERING:

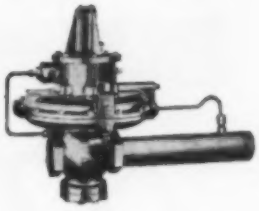
LIQUIDS AND GASES

Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

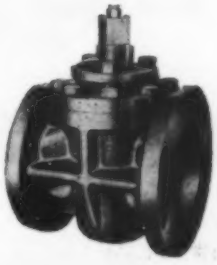


CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES



More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.



HOW MUCH COULD YOU SAVE?

There is hardly a plant anywhere—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. Certainly it's worth investigating—especially since it will cost you nothing to find out. Simply mail the coupon now.

SEND COUPON NOW!

MEASUREMENT AND CONTROL DEVICES

all fine products by

ROCKWELL

Rockwell Manufacturing Company, Dept. MC2K, Pittsburgh 8, Pa.

Please send me literature as checked:

- ☐ Valving gas, liquids and slurries. Bulletin V-612
- ☐ Measuring gases. Bulletin 1085
- ☐ Regulating gas pressures. Bulletins 1044, 1058, 1082, 1086
- ☐ Measuring liquids. Bulletins P-100, PI-666, OG-400
- ☐ Condensed catalog of all products. Bulletin C-5000
- ☐ Please have your Field Engineer call.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

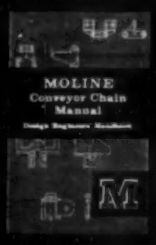
Circle 581 on postcard, page 33

SELECTION CHART for triple-tested Moline Chains*

Here is a quick, easy reference chart for comparing the seven most popular Moline Chains. Are you familiar with all the attachments available... the range of sizes... and all their applications? This chart will help you compare their size, capacity range and various uses. It's a part of the new, illustrated "Moline Conveyor Chain Manual and Design Engineers' Handbook" which is available now to help you specify the right chain for your requirements. Write today for your copy.

	CHAIN TYPE & NUMBER	APPLICATION AND INSTALLATION	ATTACHMENTS	PITCH RANGE IN INCHES	ULTIMATE STRENGTH IN LBS.
	Detachable Chains—25, 32, 33, 34, 42, 45, 50, 51, S-51, 52, 55, 57, 62, 67, 75, 77, 78, 88, 95, 103, 108, 114, 124	Widely used throughout industry, conform to "manufacturers' standard" and available in a wide variety of sizes. Many attachments make this type versatile and adaptable to any light to medium-duty conveyor service.	A-1-2-3-12-110 C-1-5-8-15 D-3-4-5 E-1 F-2-8-16 K-1-2-3-5-40-73-345 H-1-2 K-1-2-3-5-40 L-2 M-1-3 R-1-2 S-1 Scraper 1-29	.902 to 4.063	700 to 17,000
	Pintle Chains 400 class. Light weight Pintle. 700 class.	Serviceable, long-wearing, moderately-priced chain for general elevating, conveying and power transmission service for drives at low and intermediate speeds with moderate loads. In "400" lightweight and "700" class types.	A-1-12-115 D-5 E-1 F-2-5-16 G-1-6-19 K-1-2 M-1 F-2-5 F-22-6" F-2-22-8" A-2-42 K-1-2-720-A-2-730 720-M-1 M-1-2	1.375 to 4.720	4,200 to 22,000
	H-Type Mill H-60, H-62, H-74, H-75, H-78, H-82, H-85, H-87, H-95, H-124	Designed primarily for heavy drives and transfer conveyors in saw mills and pulp and paper mills but widely used throughout industry. Strong and rugged, provided with wearing shoes for stiffness and long service life.	A-1-12 F-4 G-1-6-19-48 H-1-2 K-1-2 M-3 R & L RR	1.654 to 4.000	7,000 to 30,000
	Combination Type Mill Chain 6104, 6110, 8116, 8480	Designed for the same applications as regular H-type conveyor chains and refuse chains but has larger diameter rivet, greater ultimate strength for more rugged duty in general drag conveyor service applications.		6.00 to 8.00	42,000 to 56,000
	Combination Chains—C-55, C-77, C-102B, C-102½, C-110, C-110-C, C-111, C-111-C, C-131, C-131-C, C-132, C-132-C, PW-132, C-188, MW-188	Very rugged and serviceable for use in bucket, transfer and many other types of conveyors. Widely used in cement, chemical, lumber, quarrying, mining industries. Available in pin and cotter assembly or riveted construction.	C-3-132 RF-12 F-2 G-6-19 K-1-2-3 LL-25	1.631 to 6.050	9,000 to 50,000
	Dairy Conveyor MC-33	Extensively used in dairy and bottling industries, designed for both horizontal and lateral turning. Detachable construction, interchangeable with manufacturers' standard 4250, available only in extra strength Promal.		2.500 only	12,000
	Ley bushed Chain—823, 825, 830, 844	Developed for hard, rugged service under extremely abrasive and other adverse conditions. Used extensively in conveying or elevating sand, gravel, cement and in similar industries where service demands are rigid.	K-2 F-2	4.00 to 6.00	19,000 to 40,000

Write today for your free copy of the Moline Conveyor Chain Manual and Design Engineers' Handbook.



*Call your nearby Moline dealer today for help on your chain problem. Complete design service available for special chains or unusual applications.

Leaders for 60 years

Moline Chains

MOLINE MALLEABLE IRON CO., St. Charles, Illinois

Specializing in the manufacture of chains

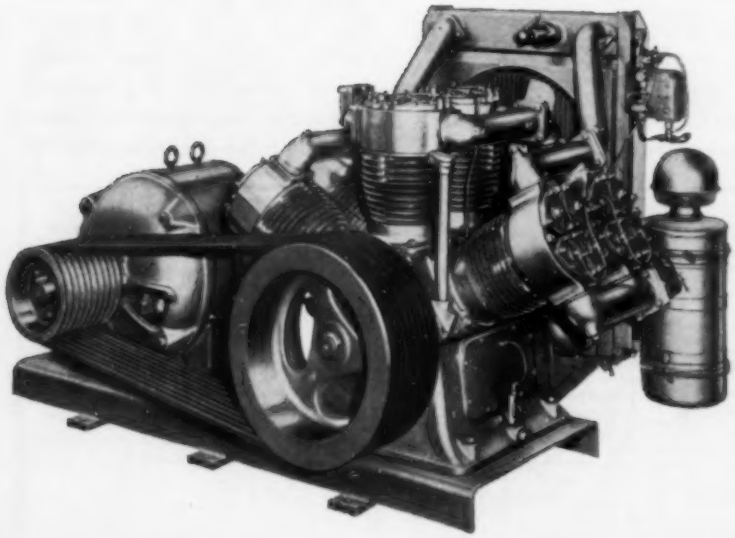
Circle 582 on postcard, page 33

Make LE ROI your one-stop source for AIR COMPRESSORS

WESTINGHOUSE unit type ½ to 15 hp. 17 models: 2 to 71.7 cfm—80 to 250 psi

WESTINGHOUSE single- and two-stage compressors are ideal for jobs in the unit type class with moderate air demand. You get long-lived dependability at low first cost. Upkeep is negligible. Units incorporate thermal overload protection, positive starting unloader, air cooled deep-finned cylinders, and corrosion-resistant automatic spring loaded floating valves.

Crankshaft is ball-bearing mounted for stability, and matched V-belt set assures balanced drive line wear. Compressors are available with horizontal or vertical tank, or bed-plate mounting. Load-unload or start-stop control is standard. Options include dual control, water-cooled aftercooler, and automatic drain valve for receiver.



LE ROI stationary type 25 to 100 hp. 4 models: 92 to 450 cfm at 125 or 175 psi

LE ROI stationary compressors provide economical and flexible air power for your heavy industrial jobs. Made in 25, 50, 75, and 100 hp sizes, these two-stage units can be used as central air supply — or you can spot units at various points of use, thus minimizing pipe runs and air loss. Air-cooling permits indoor and outdoor use, and compactness conserves space.

Features like forced-feed lubrication, large intercooler, high-speed fan, and balanced design extend motor and compressor life and cut upkeep. You can pick standard models with either dual control or continuous running load-unload control. Option extras include: crankcase oil filter, oil pressure safety switch, intake silencers, belt and intercooler guards, and water-cooled intercooler.

Ask your Le Roi Distributor for additional information. Or send for Bulletin SG-3 covering the entire line. Write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

90-102

LE ROI Division of Westinghouse Air Brake Co. Sidney, Ohio

Circle 583 on postcard, page 33

If you have anything to do with plant

take a good look at

Chances are you can get better lubrication... and save money in the bargain

To many people grease is an unglamorous and confusing subject. This is a shame, because grease is really a spectacular sort of lubricant. Nevertheless, people who don't understand it tend to forget it.

As a result, they run into all sorts of trouble. Sometimes they spend too much, buy the wrong thing, or misapply what they do buy. Sometimes they neglect to apply it at all.

True, a few years back, greases could be a headache, principally because in many cases the "right" grease simply didn't exist. To handle some of the tougher jobs grease-makers came up with the weirdest sort of concoctions. No wonder people put grease in the product-to-be-forgotten class.

But times have changed.

Grease-makers have found out a lot. They're making *better* products . . . and Sun's among the leaders in producing a full line of modern maintenance greases.

WHAT IS A GREASE?

It always pays to be sure you know what you're talking about. At least, asking such an academic question may bring to light some worthwhile points you've forgotten. Simply, a grease is a thickened oil.

By his choice of thickener, a grease-maker can make a grease with high resistance to water, to high temperatures, or to both. By using additives and inhibitors he can get certain special properties, such as tackiness, high resistance to deterioration, and so on.

You might think of the thickener as a sponge that sops up oil, thus providing a means of keeping an oil *on the job*.

Greases come into their own wherever it's hard to keep oil where it belongs, or where it's impracticable to keep replacing oil that runs away.

You can't make a good grease with crankcase drainings. You must *start* with a very carefully chosen high-quality oil. The better oil makes the better grease.

WHAT MAINTENANCE GREASES ARE AVAILABLE?

There are several principal types: The work horses, made with calcium and sodium soaps, and the glamour greases, usually made with lithium soaps, and sometimes with other soaps or other kinds of thickeners.

Most greases come in several consistencies, or "thicknesses". How they stack up is best explained in the simple chart below.

WHAT ABOUT A SINGLE MULTIPURPOSE GREASE?

Despite what you may have been told, there is no such product. That is, there is no *single* consistency of a *single* type of grease that can handle *every* operating condition. This is the unvarnished truth.

		Handle Water?	OK For High Temperatures?	What Speeds & Loads?	Relative Cost
THE WORK HORSES	Calcium Soap Grease	YES	NO	ANY	LOW
	Sodium Soap Grease	NO	YES	ANY	LOW
THE GLAMOUR GREASES	Lithium Soap Greases & Others	YES	YES	ANY	HIGH

lubrication . . .

what's happened to grease

HOW TO MAKE UP YOUR OWN MIND

You're in luck here. Modern greasemakers are just as eager as you are to cash in on simplicity. So they're cutting down the number of greases they offer, and this makes grease selection simpler for you.

You can start yourself on the way to grease modernization by asking yourself just a few easy questions:

What do I want the most?

- Good lubrication?
- The economy of simplification?
- The economy of low initial costs?
- Or some combination of these?

Of course you want good lubrication. And this is *always* available, because today, somebody, somewhere, has the grease that will stand up to whatever working conditions you've got to handle. The grease you need exists.

So now you're down to the remaining questions: Simplification? Low initial cost? Or a combination? The chart at the bottom of this page tells the story.

HOW MUCH SIMPLIFICATION?

Sometimes you can simplify yourself into spending *more* money, not less. Just the same, most people buy too many greases.

Many plants can do quite well with a single maintenance grease. This is hard for many people to believe. But it can be done, economically, in an amazing number of plants. Yours may be one of these. Many plants, of course, need two or three greases, but rarely any more.

When you're simplifying, the trick's in knowing when to stop.

THE VITAL LAST STEP

Now . . . you need to go only one step farther: You need to find *products* that will handle *your* needs.

And you need *savvy*, to analyze your needs, to pick the best product mix, and to apply wisely the products you buy.

Again the answer's simple. Sun has the *products* and the *savvy*. If you're really interested in getting the most out of grease, your Sun man can help you. Call him. Put the challenge to him. Call him today and tell him that you want to talk grease.

TECHNICAL BULLETIN

If you're not disposed to talk, then you should ask for Sun's new Technical Bulletin 69. It gives complete information on all of the basic types of maintenance greases in a comprehensive, orderly fashion, and lists full details on the major greases Sun makes. For your copy write to: **SUN OIL COMPANY, Dept. PT-10, 1608 WALNUT STREET, PHILADELPHIA 3, PENNSYLVANIA.** In Canada: Sun Oil Company Limited, Toronto and Montreal. Or call the Sun representative nearest you.

	Relative Grease Costs	Storage & Handling Costs	Chances of Failure Through Misapplication	REMARKS
Simplification?	HIGH	LOW	LOWEST	Usually, you'll need a glamour grease or two, and this will increase grease costs. This is not necessarily true in plants with narrow ranges of operating conditions or where you don't need one grease to handle, for example, high temperatures and water. In these cases you can often achieve simplicity by using one or two modern calcium or sodium greases in place of half a dozen.
Low initial costs?	LOW	HIGH	HIGHEST	When you have no condition that requires glamour greases, you can use moderate-cost calcium and sodium greases. This keeps grease costs down, but they can be overbalanced by higher storage and handling costs. Failures from misapplication are also more likely.
Combination of simplification and low initial cost?	MODERATE	MODERATE	MODERATE	Just about always the best solution. The bigger the plant, the more varied the needs, the more important a compromise becomes. Of the three, this is the hardest course to chart; to follow it wisely, expert advice is a must.

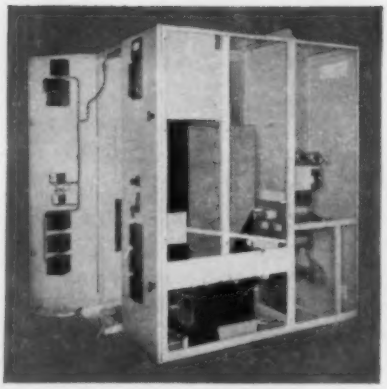
Circle 584 on postcard, page 33

More features make Westinghouse metal-clad switchgear

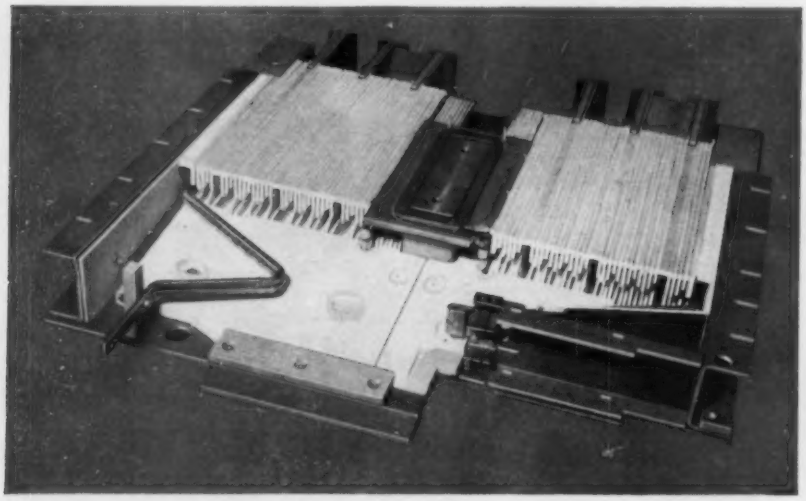
Westinghouse metal-clad switchgear is design proved in the Westinghouse High Power Laboratory. It meets all industrial, electric utility, commercial, institutional, and other needs for 75 to 1000 mva service inclusive, 4.16 through 13.8 kv.

Check below for advantages of this equipment that are of major importance to you.

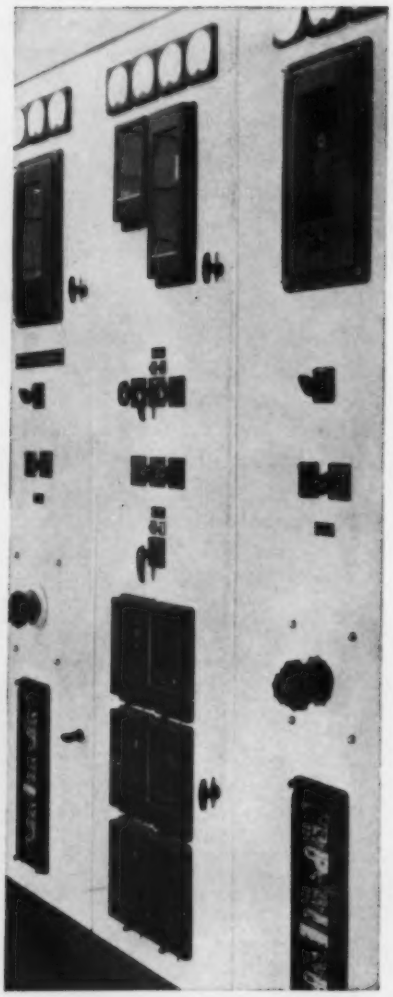
For further information, call your Westinghouse representative or write for a copy of Descriptive Bulletin 32-250 to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's Westinghouse.*



Balanced insulation protection is provided by the exclusive "Limitrak" insulation system on bus supports, arc chute enclosure and breaker bushings.



Fast, positive circuit protection is provided by the De-ion principle of arc interruption with center coil arc chute design.



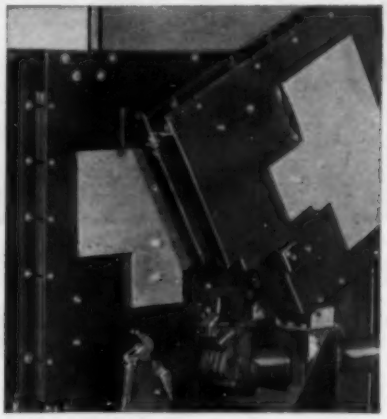
Adequate space for varied relaying and instrumentation is assured by full height front panels.

your best buy

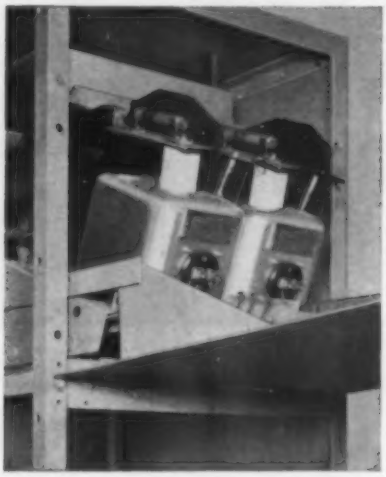
Simple, quick inspection, maintenance and replacement of DH breakers is made possible by horizontal drawout construction.

Complete joint sealing with polyester compound at main contact supports and main bus provides full insulation.

Proper component functioning is verified by a continuing program of production inspection and testing.



Hinged arc chute permits easy tilting for inspection and maintenance of contacts with DH breaker in drawout position.



Personnel are protected by separate compartment drawout-type mounting of potential transformers.

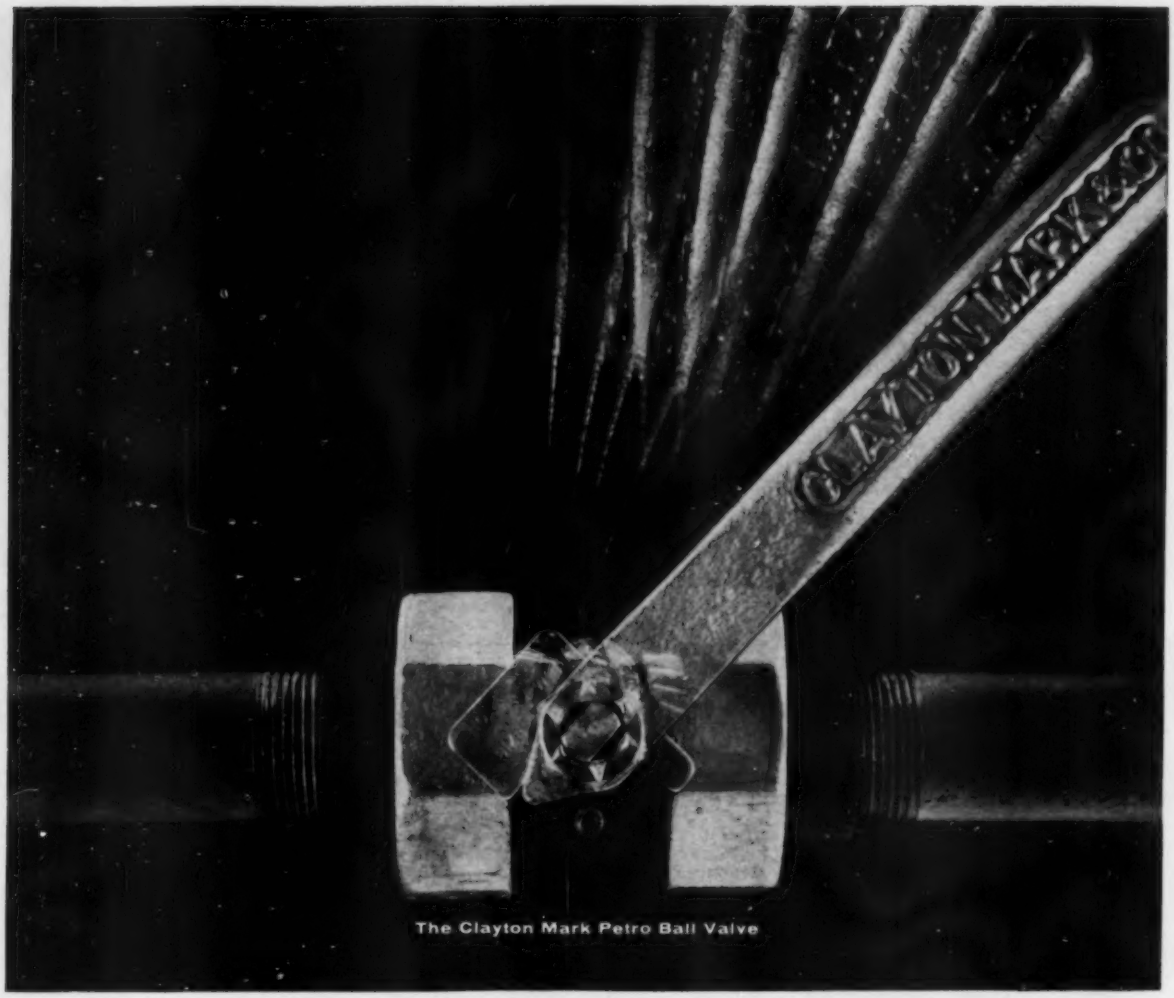
Front panel is protected during assembly, shipment and installation by strippable plastic coating.

Thorough phosphatizing and priming treatment safeguards against corrosion and provides a superior base for finish coat.

Circle 585 on postcard, page 33

Westinghouse

J-61014

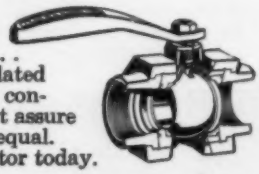


The Clayton Mark Petro Ball Valve

opened & closed a quarter million times under maximum pressure... without a failure

The true test of *any* product is to put it through its paces under maximum pressure conditions. Our engineers did this with the Petro Ball Valve—operating it 250,000 times without a single breakdown. We've yet to see another ball valve that can top it.

The Petro Ball Valve has the largest port opening of any ball valve . . . double union ends for easy installation . . . dual, interchangeable seats . . . tighter, completely contained seals . . . easy working handle . . . cadmium plated nuts, and rustproof one piece forging construction. They're bonus features that assure you ball valve performance without equal. Talk to your Clayton Mark Distributor today.



OTHER QUALITY PRODUCTS FROM CLAYTON MARK

The High Pressure Positive Sealing #750 SHUT OFF VALVE 10,000 PSI

Readily adaptable for use in the chemical, hydraulic, food processing, lubricating, fuel and steam fields. Perfect for air (gas) and vacuum systems, too. Bubble tight teflon to metal seat assures leak proof performance.

Screwed or Socket Weld FORGED STEEL UNIONS

Feature pressure tightness, ease of installation, interchangeability. You stock *one* union for any job. Hot press forging assures greater shock resistance. Choose from a variety of unions for your special needs.

Screwed or Socket Weld FORGED STEEL FITTINGS

For steam, water, oil, oil vapor, gas or air applications. Available in 2000, 3000, 4000, and 6000 lbs. Screwed and socket weld, carbon and alloy steel. All come in a wide range of styles and sizes from ⅛" through 4".

CLAYTON MARK AND COMPANY

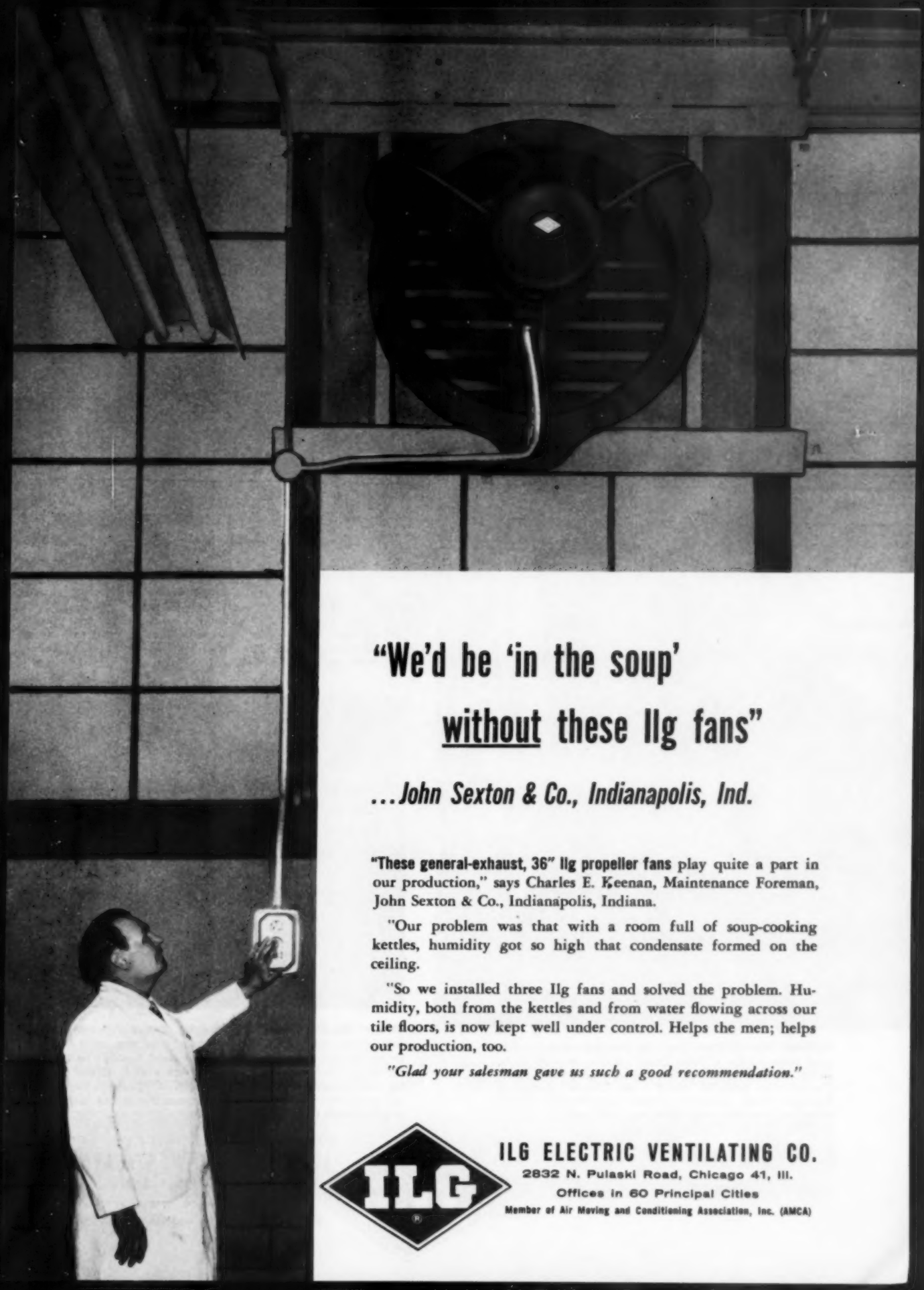
1900 DEMPSTER STREET · EVANSTON, ILLINOIS · U.S.A.

PUMPS · WATER WELL SUPPLIES · CONDUIT · UNIONS · TUBING

AB-3197

Circle 586 on postcard, page 33

Circle 587 on postcard, page 33 →



"We'd be 'in the soup' without these Ilg fans"

...John Sexton & Co., Indianapolis, Ind.

"These general-exhaust, 36" Ilg propeller fans play quite a part in our production," says Charles E. Keenan, Maintenance Foreman, John Sexton & Co., Indianapolis, Indiana.

"Our problem was that with a room full of soup-cooking kettles, humidity got so high that condensate formed on the ceiling.

"So we installed three Ilg fans and solved the problem. Humidity, both from the kettles and from water flowing across our tile floors, is now kept well under control. Helps the men; helps our production, too.

"Glad your salesman gave us such a good recommendation."

ILG

ILG ELECTRIC VENTILATING CO.
2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

Here's why ILG propeller fans and propeller fan roof ventilators satisfy

Put a Pilsner on any Ilg propeller fan (as on this 42" model), flip the switch so the fan runs at full speed, and you won't find any bubbles in the beer due to vibration. Careful dynamic balancing of all component parts, and electronic checks of motor and wheels guarantee that smooth, silent operation is as much a part of every Ilg propeller fan as the "One-Name-Plate" pledge of performance. At Ilg that means every fan will last indefinitely —*without expensive maintenance.*

Upblast Ventilators from Ilg installed above hoods over soup kettles at John Sexton & Co., provide high-speed, vertical exhaust. Airfoil-design propeller blades (in five sizes from 24" to 48") are direct-connected to Ilg-built totally enclosed motors. Five sizes to choose from for capacities from 5060 to 33,000 cfm.
WRITE FOR CATALOG DB3-300.

Follow the Flame and see why Ilg direct-connected propeller fans always run "cool." Note how the vent pipe sucks in outside air to *pressure-cool* permanently lubricated Ilg-built motors, both the single-phase permanent-split capacitor and 3-phase types. At Ilg you get cost operating advantages of *open-type* motors plus the protection of *totally enclosed* types. No motor lasts longer!
WRITE FOR CATALOG DB1-100.

ILG ELECTRIC VENTILATING CO.
2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities
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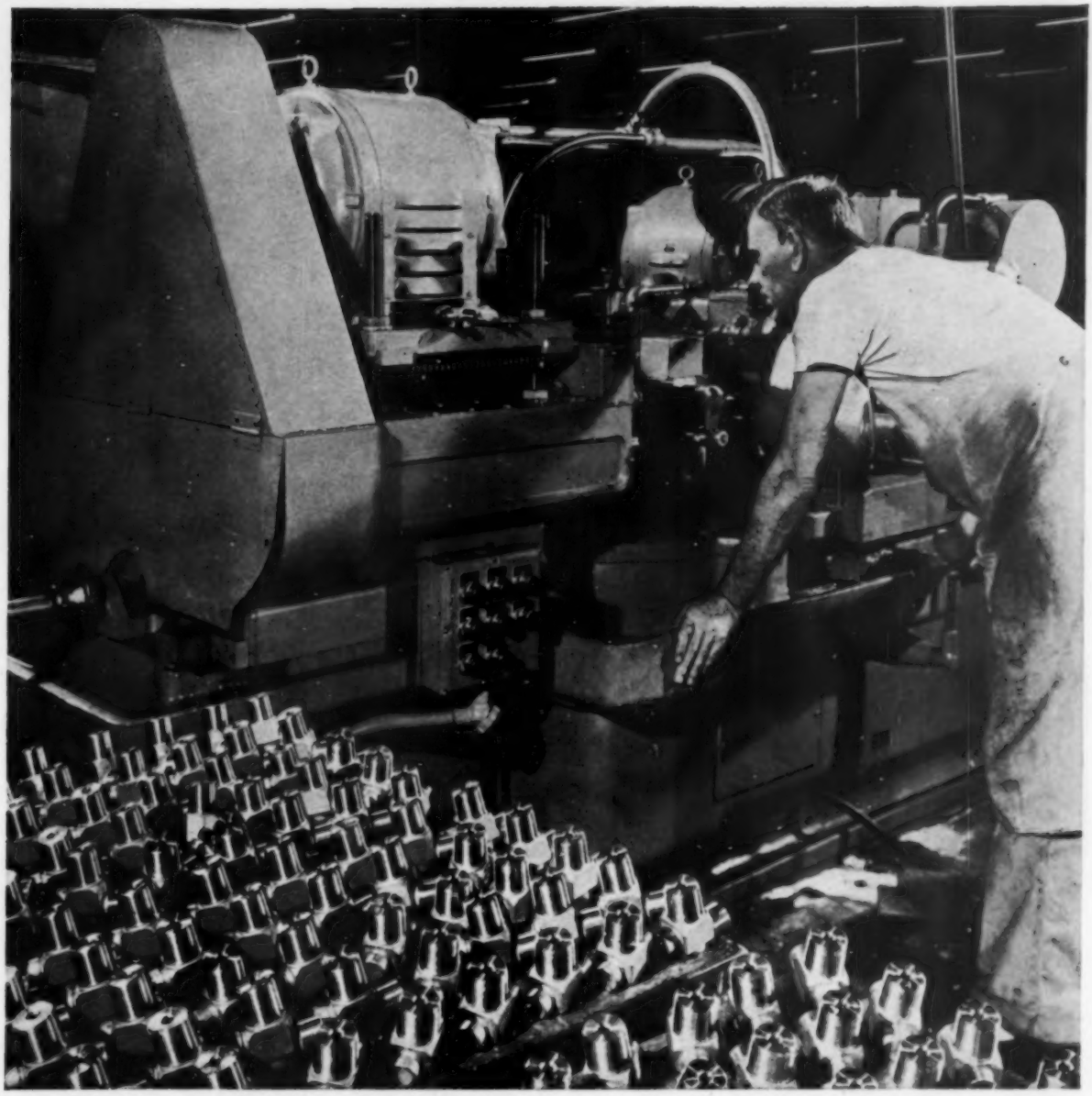


TIGHT TOLERANCES DEMAND DORTAN® CUTTING OILS

DORTAN transparent cutting oils provide clear visibility; make measuring and gauging easy; help promote precision and fine surface finishes. Machine operators can flood work and tool areas with a full stream of Dortan and still see what they're doing.

Sulfur, chlorine, and other active agents enhance the excellent machining properties of Dortan cutting oils. Low pour points make handling easy at low temperatures; high flash points help prevent smoking in use. Four grades cover a wide range of machinability from easily machined ferrous and non-ferrous alloys to stainless and heat-resistant steels.

NEBULA® EP is an efficient multi-use grease for most bearings and machine tools. It resists softening which prevents its running out even under extreme heat and pressure conditions. Your Esso Representative can help protect your precision and profits. Give him a call, or write to us at 15 West 51st Street, New York 19, New York.

HUMBLE OIL & REFINING COMPANY

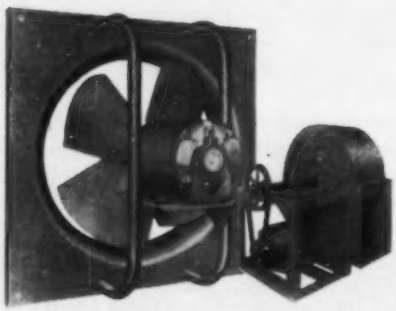
Circle 588 on postcard, page 33

Talk About Fans!

Okay, let's talk about fans . . . Peerless Electric Fans in particular. Breeze or hurricane . . . you name it, and there's a Peerless Electric Fan to produce it. All-welded construction keeps scroll, housing and inlet firm and quiet. Air passes through at peak efficiency. All-welded wheels are statically and dynamically balanced for perfect rotation. Peerless Electric Fans can be specified with confidence, installed with ease, and operate inconspicuously and dependably for years.

Investigate Peerless Air Moving Equipment Today! Write to Peerless Electric Division, H. K. Porter Company, Inc., 1405 West Market St., Warren, Ohio.

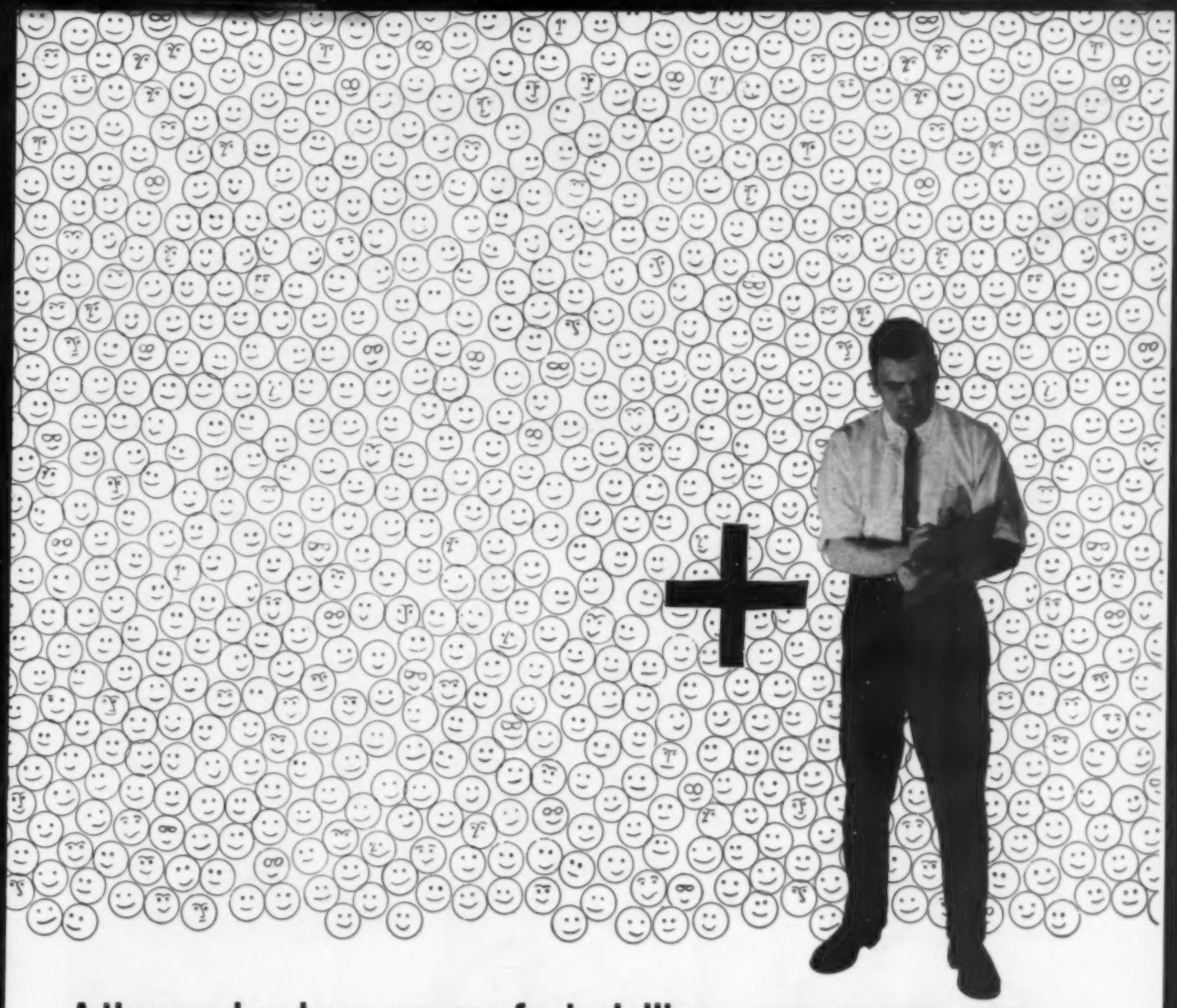
Manufactured and sold in the western states by Master Fan Corporation, H. K. Porter Company, Inc., 1323 Channing Street, Los Angeles 21, California. NOW AVAILABLE—Centrifugal Blowers to 132" wheel diameter, Turbo Blowers to 55" S. P., Tube and Vaneaxial Blowers and Industrial Fans to 104" wheel diameter.



PORTER **PEERLESS ELECTRIC DIVISION**
H. K. PORTER COMPANY, INC.

Member—Air Moving and Conditioning Association, Inc.

Circle 589 on postcard, page 33



A thousand and one reasons for installing

USS Multigrip Steel Floor Plate

If you have a thousand employees you have a thousand reasons for installing USS Multigrip Safety Floor Plate. But accidents can happen to anyone, so you'll be protecting yourself, too. Covering all the danger spots in your plant may prevent costly accidents. The riser pattern on USS Multigrip is scientifically designed to give positive traction in all directions, wet or dry. And Multigrip has no closed pockets to collect dirt and water—it sweeps clean in a stroke.

Multigrip protects floors, too. These rugged, heavy-duty floor plates will take the pounding of heavy traffic year after year with little wear or maintenance. Multigrip can't chip, splinter, or crack. It comes in ⅛" to ½" thick plates up to 600 inches long, so is easy to install without waste. Your Steel Service Center representative will provide you fast delivery of any size Multigrip Steel Floor Plate. Contact him for more information or write United States Steel, 525 William Penn Place, Room 6283, Pittsburgh 30, Pennsylvania.

This mark tells you a product is made of modern, dependable Steel.

USS TRADEMARK

United States Steel

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal & Iron Division • United States Steel Export Company

Circle 590 on postcard, page 33

USED TO THINK EVERY STEAM TRAP LEAKED STEAM.

THEN I FOUND ONE THAT DIDN'T, BUT IT WOULDN'T VENT AIR.

FOUND ONE THAT VENTED AIR, BUT IT NEEDED A COOLING LEG.

DISCOVERED A TRAP THAT REMOVED CONDENSATE AT STEAM TEMP, -MAINTENANCE WAS TOO HIGH.

THEN I FOUND A ~~LOW~~ MAINTENANCE TRAP. IT DIDN'T WORK AGAINST BACK PRESSURE.

AT LAST I FOUND ONE THAT WORKED AGAINST BACK PRESSURE, BUT IT'S CAPACITY RATING WASN'T DEPENDABLE.

ARMSTRONG PROMISES TRUE CAPACITIES AND EVERYTHING ELSE, SO I CALLED THEM. THEY TOLD ME TO RELAX. I COULDN'T.

THEY TOLD ME ABOUT ARMSTRONG'S GUARANTEE. WHAT'D I HAVE TO LOSE. I TRIED THEM.

EFFICIENCY IS UP, FUEL BILLS ARE ~~DOWN~~ SO ARE MAINTENANCE COSTS. MAN I'M LIVING!

No one trap can do *everything* better than every other trap. Some traps vent air better than others, some remove condensate faster, etc. But, there is no one trap *best* in every phase of trapping. Armstrong has been manufacturing the Inverted Bucket Trap for nearly fifty years, and though the traps have changed with the requirements of the times, the Inverted Bucket principle has remained. For on overall trap performance, year-in and year-out, nothing beats the Armstrong Inverted Bucket Trap. It's a rugged well-built trap that does *more* things better than any other trap. It's guaranteed because it's been proved.

For more details, see your Armstrong Representative and start living . . .

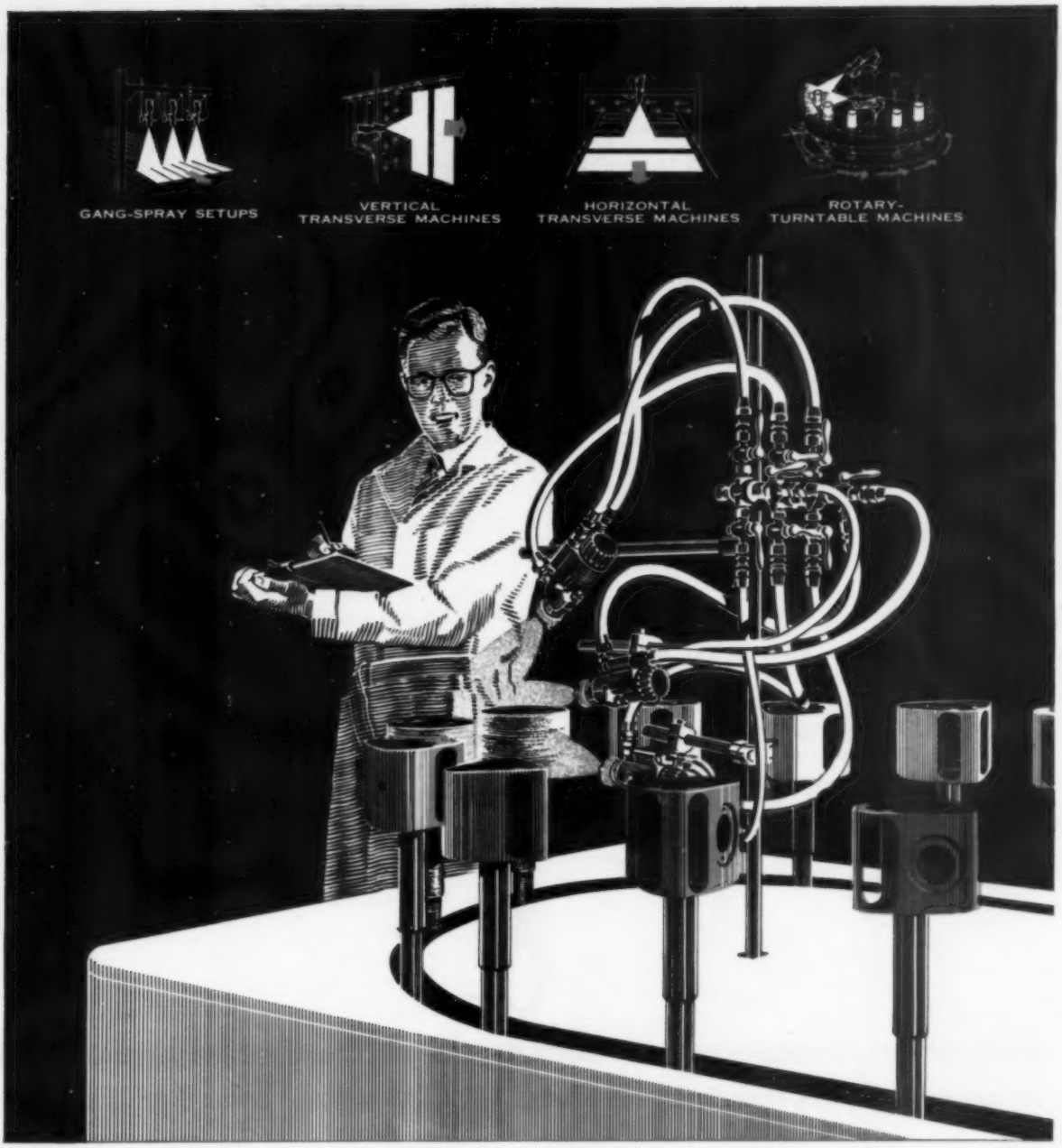
P. S. Like some good meaty reading? Ask for the 48-page Armstrong Steam Trap Book.

ARMSTRONG MACHINE WORKS

9128 MAPLE STREET
THREE RIVERS, MICHIGAN

011-ST

Circle 591 on postcard, page 33



Know in advance if automatic spray will work for you!

Many manufacturers have benefited from the uniform and precisely controlled application of automatic spray. DeVilbiss makes it easy to find out whether automatic spray is practical and economical for you, *before you buy*. Here's how:

Utilizing your own coating formulation, we'll give samples of your products trial production runs on standard automatic machines, duplicating your in-plant conditions as closely as possible. The results will let you know whether or not automatic spray will pay off for you. Our report tells you the most economical production rates and recommends which type of automatic machine will give you the best job at lowest possible cost. No charge for this service.

More likely than not, automatic spray *can* boost your finishing rates and cut your material consumption. If you're interested, let us know. We'll take it from there. The DeVilbiss Company, Toledo 1, Ohio. Also Barrie, Ontario; London, England; São Paulo, Brazil. Branch offices in principal cities.

FOR TOTAL SERVICE, CALL
DEVILBISS

Circle 592 on postcard, page 33

Get complete, odorless, smokeless waste disposal with a GAS-operated Joseph Goder incinerator.

What's your waste disposal problem? Biological waste from a laboratory? Food refuse from the cafeteria? Wet or dry rubbish? Whatever it is, you can change it from a problem into a simple, trouble-free routine with a gas-operated Joseph Goder Incinerator. With the intense, consuming flames of gas, Joseph Goder Incinerators completely destroy all combustible waste. A patented after-burner eliminates smoke and odor. Absolutely no air pollution. You save money and time on labor, maintenance, refuse storage and refuse removal. And thrifty gas keeps fuel costs low.

For complete, smokeless, odorless waste disposal rely on gas and a Joseph Goder Incinerator. There's a type and size for any waste disposal problem. Call your local Gas Company, or write Joseph Goder Incinerators, 4241 N. Honore Street, Chicago 13, Illinois.

Henry F. Miller, Plant Engineer at Waltham Hospital in Waltham, Massachusetts, checks his gas-operated Joseph Goder Incinerator.

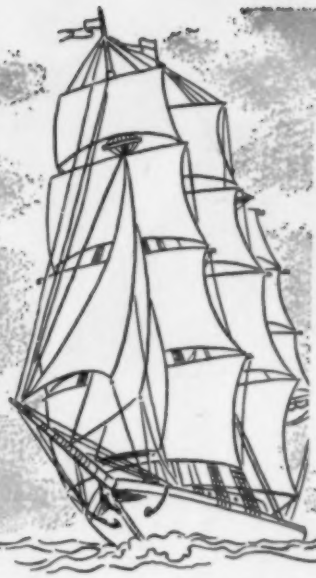
American Gas Association

FOR WASTE DISPOSAL GAS IS GOOD BUSINESS!

Circle 593 on postcard, page 33

Why Rust-Oleum is different—

and what this difference, backed by 35 years of industry proof, means to you!



A Sea Captain developed it . . . Industry proved it!

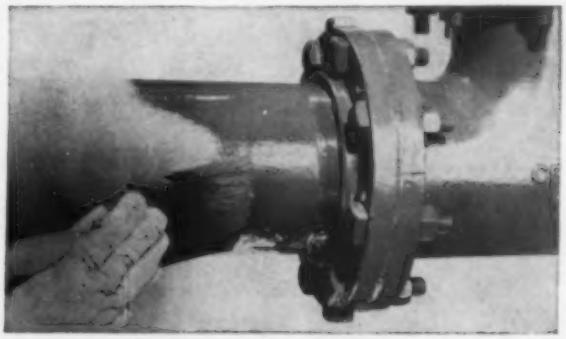
The original Rust-Oleum formula was developed nearly fifty years ago by Sea Captain Robert Fergusson, who became intrigued with the rust-stopping qualities of fish oil early in his career. Creating a *special treatment* for the fish oil, he used the *specially-processed fish oil* as the vehicle in combination with fine rust-inhibiting pigments. The result? A coating that actually *stopped rust* when applied directly over sound rusted surfaces, after scraping and wirebrushing to remove rust scale and loose rust. Possible, because the *specially-processed* fish oil penetrated the rust to bare metal. This was the birth of Rust-Oleum's *exclusive* 769 Damp-Proof Red Primer.

PROVED THROUGHOUT INDUSTRY FOR OVER 35 YEARS

Today, Rust-Oleum in its many systems and colors, has been proved throughout industry for over thirty-five years. This proof by leading industrial users is your assurance of savings in time, money, and metal. Economies made possible by the fact that Rust-Oleum 769 Damp-Proof Red Primer goes right over the sound rusted metal—usually eliminating costly surface preparations. And Rust-Oleum, in its various systems, resists rain, sun, fumes, heat, weathering, chemicals, etc., for lasting beauty over the years.

RUST-OLEUM NEW COLOR HORIZONS SYSTEM

The Rust-Oleum New Color Horizons System introduces a new coating concept to industry. It combines four important factors: (1) the ability to stop rust, (2) smart, modern color harmony, (3) the durability to last and last, (4) ease of application that saves time, money, and metal. See how this system can bring lasting beauty to your plant, machinery, equipment, pipes, tanks, structural steel, fences, etc. Write for complete information or contact your nearby Rust-Oleum Industrial Distributor. He maintains complete stocks for prompt service.



RUST-OLEUM®

There are imitations, but only *one* Rust-Oleum. It is distinctive as your own fingerprint.

STOPS RUST!®

ATTACH TO YOUR LETTERHEAD

Rust-Oleum Corporation
2490 Oakton St., Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ New Color Horizons Systems Catalog featuring 110 actual color standards and 69 photo applications.
- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer to be applied over sound rusted surface.
- ☐ Results of radioactive tracing study on Rust-Oleum fish oil penetration.

Circle 594 on postcard, page 33

How AMOCOOL* Transparent Coolant helped improve profit picture in this plant

*Trademark

BY PAUL E. "PAPPY" STRATTON

About the Author. "Pappy" Stratton has been providing technical help on lubrication and metalworking problems to customers in the Detroit area for nearly all of the twenty-five years he has been working for the company. In addition to having this store of practical experience to help him, Pappy has completed the Company's Sales Engineering School.

* * *

By using a soap-base grinding compound, Detroit Edge Tool Company was getting excessive corrosion and rust on work and grinding machines. Oil vapor was collecting on machines and on the ceiling, causing dirty working conditions. Most important, high wheel loading was causing frequent down-time for wheel dressings.

We worked out a test program on AMOCOOL Transparent Coolant with the management. On our first test on one surface grinder, feed pressure was cut substantially while at the same time metal removal was increased.

Eliminate reworking because of rust, reduce wheel loading and extend intervals between wheel dressings; do these and you increase profit per unit, explains Detroit Edge Tool president, Dan Ebbing, to P. E. "Pappy" Stratton of American Oil. Plant manager, John Yonker (right) and Sam Vineh, operator, look on.

The cost of reworking parts to remove rust was eliminated. Time required to clean machines to get rid of the odor was cut in half. Less wheel loading and fewer wheel dressings have upped production and reduced costs. Our test program paid out in an improved profit picture. All grinding and drilling equipment has been converted to AMOCOOL Transparent Coolant.

* * *

Would you like this kind of technical help to assist you in improving profits? Get it by calling the American Oil Company office nearest you.

Quick facts about
AMOCOOL
Transparent Coolant

- Clear, transparent fluid
- Controls corrosion on work and machines
- All chemical. Does not support bacteria growth
- Unaffected by humidity
- Fire resistant.
- Odorless

AMERICAN

AMERICAN OIL COMPANY
910 South Michigan Avenue
Chicago 80, Illinois

Circle 595 on postcard, page 33

NEW

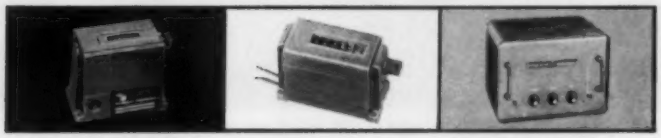
simplified photoelectric counting equipment

new matched design offers

- SIMPLIFIED OPERATION
- LASTING DEPENDABILITY
- MINIMUM MAINTENANCE

Now General Controls brings you the successor to present-day counting equipment actuators. The new General Controls photoelectric light source and receiver feature integral power supplies—built-in internal intensity adjustment for long life and minimum maintenance. Engineered to withstand high vibration without failure. Available in five different combinations of light sources and receivers—housed in remote or matching dustproof, splash-proof aluminum cases.

There's a General Controls PIC Electric Counter to fit every purpose



CE-800 Super Wizard Electric Counter

- 200 million count life
- Built-in rectification for reliability and quiet AC operation
- Available in completely dustproof, tamperproof gasket-sealed housing

CE-600 Industrial Electric Counter

- 50 million count life
- Built-in rectification for reliability and quiet AC operation
- Basemount, panelmount knob reset, panelmount key reset and electric reset models

CE-901 Predetermining Counter

- 1000 counts per minute
- Employs any sensing device operating within actuator specifications
- Steel case protects components from dust, moisture — Desk and rackmount models.

AUTOMATION CONTROLS DIVISION

GENERAL CONTROLS

8080 McCormick Boulevard • Skokie, Illinois

Circle 596 on postcard, page 33

Stronger construction—Neater appearance—Easier to assemble

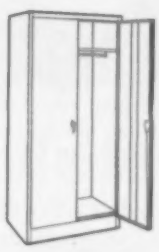
HALLOWELL

800 SERIES STORAGE CABINETS*

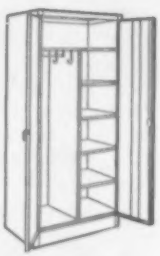
Here is a new and better line—at *no increase in cost!* Made of heavier gauge steel for maximum durability. Better looking, too. All parts fit flush. No exposed bolt heads on front or sides. Doors and frame are pre-assembled . . . insure accurate fit and easy mounting. 3-point locking with spring tension clips for positive, quiet operation. Chrome plated handles with lock. Built-in shelf supports permit easier shelf adjustment on 2-inch centers.

**Meet Federal Specification AA-C-31a*

MODEL 815
Storage cabinet with double door and 4 adjustable shelves.



MODEL 835
Wardrobe cabinet with double door . . . holds 12 to 16 heavy coats.



MODEL 855
Combination cabinet with double door . . . wardrobe and 4 shelves.

SIZES: 36" wide, 78" high, 18" and 24" deep.

Mail coupon for more information

COLUMBIA-HALLOWELL Division SPS
Jenkintown 26, Pa.

Please send me complete information on the new Hallowell Storage Cabinets.

NAME _____ TITLE _____
(Please Print)

FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE ____

COLUMBIA-HALLOWELL Division SPS JENKINTOWN 26, PA. • SANTA ANA, CALIFORNIA

where reliability replaces probability

Circle 597 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

Edited by M. E. Heniken

MODERN AREA LIGHTING illuminates and decorates all outdoors

FULL UTILIZATION of outdoor areas and attractive appearance of plant buildings and grounds are benefits reported for this manufacturer's recently expanded and coordinated area lighting program. In addition to traditional floodlights, the new lighting package includes two mercury units and two fixtures utilizing Quartzline lamps. There are also three post-mounted units: one for incandescent light only, one suitable for both mercury and incandescent, and one for fluorescent light.

Mercury floodlights are available up to 400 w in the smaller of two sizes; in 700, 1000 and 1500 w in the larger. Both are intended for applications where lights will be used more than 1000 hr a year, and where a wide-angle beam is desirable. Ballasts are built-in for neat appearance and faster installation—only a simple terminal board connection is required.

In the incandescent line are two models employing the Quartzline lamp with its higher lumen output, controlled beam and longer life. For 500 and 1500 w, these units have wide horizontal beam, narrow vertical beam with sharp cut-off. They permit lighting of larger areas with fewer poles and are particularly suited for illuminating broad surfaces, such as building fronts.

Where low mounting height is practical and aesthetic appeal important, new attractively styled units for post mounting enhance modern architectural surroundings. They serve a range of lighting needs and fit the budget. They come in aluminum and five optional colors—space blue, coral, aqua, wood beige and twilight gold.

Designed primarily for 175- or 250-w mercury vapor lamps, but accommodating incandescent lamps to 405 w, is a capony-covered luminaire with shatter-resistant acrylic plastic refractor. It may be had with photoelectrical control or for remote switching and can be "customized" with trademarks or other insignia. Use of mercury is suggested only where utilization of the light will exceed 1000 hours a year. Available with circular or four-way light distribution pattern, it is suggested for roads and walkways, and front entrance drives.

Powerpack mercury floodlight, shown left above, resembles small TV set. At right is Quartzline lamp floodlight.

For incandescent lamps only, is an inexpensive design with "coolie hat" canopy and rippled glass globe. It takes up to a 6000-lumen, 405-w lamp, gives a soft, practically glare-free light distribution of a circular shape.

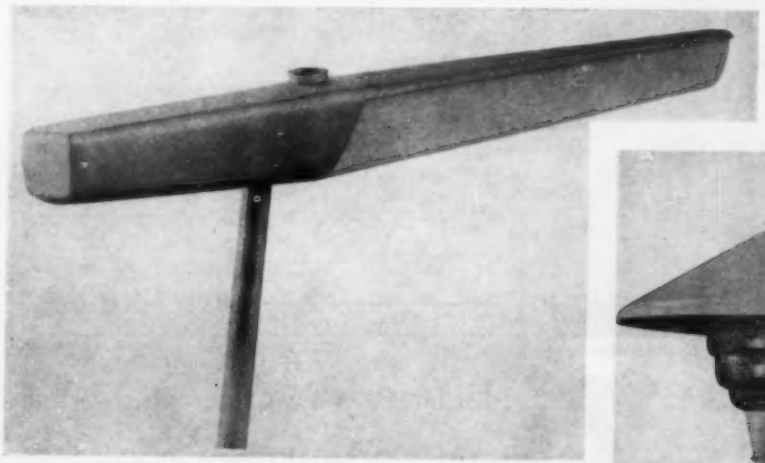
The post-mounted flourescent fixture —claimed the only one of its kind—is designed for 10- to 20-ft mounting heights. It carries a single 4-ft, 6900-lumen Power Groove lamp and cants into the sky with lines that blend with modern buildings and landscaping.

To control these and other units is a "quick-response" photoelectric control for applications where extended time delay is not desired. Keyed to the whole area lighting program is a Designer's and Buyer's Guide (Publication GEA-7223) available without charge to plant engineers. Besides giving application and installation information on fixtures and related equipment, it shows how to make the most of area lighting. General Electric Co.

For details, circle 1 on Post Card

(More Equipment on page 192)

It's easy to obtain product data with the postage-free Reader Service Card provided on pages 33-34. Use them for information on advertised products, too. Just circle the key number at bottom of the ad.



Post-mounted fluorescent luminaire is streamlined, economical. Produces 6900 lumens from 150 w of power. Shown below are postmounted filament (left) and mercury luminaires.

Get 500 KVA CAPACITY and SAVE SPACE too!..

with new Power-Zone Unit Substations

Square D's new design provides every feature you could want in a packaged unit substation. New Power-Zone substations are really compact, are available in capacities from 75 to 500 3-phase KVA—primaries to 4800v, secondaries to 600v. Here's why, feature for feature, Square D Power-Zone unit substations are the best you can buy.

Quiet-operating • Ideal for areas where transformer hum is disturbing. Guaranteed maximums of 50 db for 300 KVA and 53 db for 500 KVA—8 and 7 db respectively below latest NEMA standards.

Extra safety • High voltage compartment door interlocked—switch must be open when door is open. A safety-glass window in the door lets you inspect switch, fuses and compartment without opening the door—you can see you're safe. Steel barriers isolate high voltage, low voltage and transformer sections.

Easy installation • Substation delivered completely assembled and wired. No need to remove fuses or other equipment to install power wiring. Greatly reduced weight helps handling. 10-inch gutters in low voltage section give ample wiring space. Strong continuous base makes moving on rollers easy, eliminates substation floor to simplify bottom conduit entrance.

Easy to use • Rotary tap changers assure correct contact pressures, prevent loose connections or stripped terminal threads. An expanded metal grille in the top allows easiest transformer inspection—just lift the protective hood. Grille can be removed for normal transformer cleaning. Efficient ventilation system gives cool operation, long transformer life. Requires only 19 sq. ft. floor space. No rear or end aisles necessary—all components front-accessible.

Wide versatility • Power-Zone unit substations can contain a high-voltage air interrupter switch, fused or unfused, or oil-filled cutouts. Low-voltage molded case breakers—metering equipment—QMB fusible switches, circuit breakers, motor starters—all can be supplied. Special components or metering available in extra sections on both high and low voltage ends. Forced air cooling system available to increase KVA capacity by as much as one-third.

Get the complete story • Write Square D Company, Mercer Road, Lexington, Kentucky, or contact your local Square D Field Engineer

SQUARE D COMPANY

wherever electricity is distributed and controlled

Circle 598 on postcard, page 33

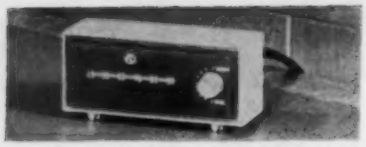
PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

MULTI-ACID removes rust down to bare metal

Aci-Gel is a multi-acid material which removes rust to bare metal by chemical action, at a fraction of the cost of wire-brushing, blast cleaning and flame cleaning. It brushes on, flushes off with water, leaves a clean surface for painting. Suspended in a thixotropic gelling agent, the material clings to vertical surfaces. Sloan Chemicals, Inc.

For details, circle 2 on Post Card



DESK THERMOSTAT lets you dial your own comfort

The Executat takes no more desk space than a conventional desk clock, yet is heavy enough to prevent accidental brushing or tipping. It is pneumatically operated, readily adapted to any space temperature control application. With advance planning, the Executat can be relocated when desk or office requirements are changed. It is also suited for conference rooms where temperatures accommodate varied-sized assemblages. The direct action thermostat has a range of 60 to 85 F with accuracy given as ± 1 deg. Finish is white and gray with silver trim. The Powers Regulator Co.

For details, circle 3 on Post Card

WHITE ROOF COATING beats heat, protects roof

White Top, a white butyl rubber alkyd compound, has heat reflective qualities which cool building interiors as much as 15 deg in warm weather. Used on roofs in average condition, it extends roof life from 4 to 5 yr, according to manufacturer. White Top is suitable for built-up roofs, rolled roofing, asbestos and asphalt shingle, felt and tar roofs, cement and unglazed tile and galvanized metal roofs—not for gravel or wood shingles.

It is explained that White Top impregnates the roof and becomes part of it, expanding and contracting with the roofing. It doesn't bleed and is impermeable to moisture. Claimed unaffected at temperatures from —70 to 140 F, it also resists acids, salts and carbons in the air. Plant maintenance crews can apply it and no undercoating is required unless the roof is metal. Superior Paint & Varnish Corp.

For details, circle 4 on Post Card

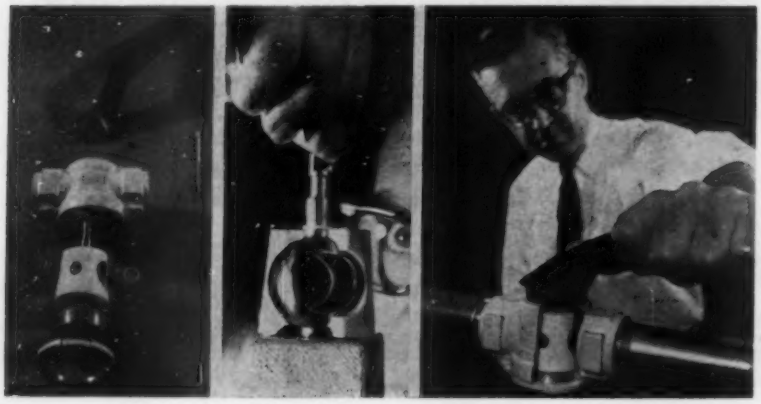
BALL VALVE with molded Teflon sealing element can be adjusted and serviced on the line

Heart of the Con-O-Sphere is its sealing capsule of conical shaped Teflon which is molded around the ball that controls the valve's on-off action. Benefits afforded by this capsule make the valve advantageous to virtually every type of processing line. Construction is simple, as the capsule with its integral handle stem replaces several parts found in conventional ball valves. Only other parts in the Con-O-Sphere are the body, handle, Teflon stem seal (a small washer), screw-in base plate, lock nut and set screw.

Maintenance is simple, too. All adjustments are made by tightening the base plate. Manufacturer explains that Teflon, a tough resin impervious to practically all materials, cold flows toward the area of least resistance. Thus, as it is pushed from below by tightening the base plate, it is brought into increasingly closer contact with both ball and valve body to guard against possible leaks. Life of the Con-O-Sphere is claimed indefinite—a test valve is reported to have undergone 500,000 cycles of opening and closing without deterioration. But if extreme usage requires rebuilding, it can be done in the line in about 3 min. Removal of base plate and handle lets the sealing capsule drop out. Replacement of capsule and stem seal "rebuilds" the valve.

Made in sizes from ⅛ to 2 in., and in working pressures from vacuum to 1440 psi, the Con-O-Sphere is available in many metals including ductile iron, carbon steel, bronze, aluminum and stainless steel alloys. The ball is stainless steel. This valve has application wherever handling of gases, liquids and abrasive or viscous ladings is vital. A working model of the sealing cap-

Want a "noodle?" This model of the Con-O-Sphere's sealing capsule shows how it works. Use the Reader Service Card to get a "noodle" for yourself.



All seven parts of the Con-O-Sphere are pictured at left below. Cutaway of sealing capsule, center, shows steel ball molded within a Teflon block—like the yolk in the white of a hard boiled egg. Cutaway of valve, right.

HOUGHTON HYDRAULIC FLUIDS

Important differences in fire-resistant fluids

Unlike petroleum oils, fire-resistant fluids have markedly different chemical properties which should be carefully considered before making a final selection.

To simplify this selection, we show here some of the variables—and limitations—of the three major fire-resistant types. Houghton is uniquely qualified for this unbiased analysis since we favor no one type over another. We make them all—and a full range of hydraulic packings as well.

1. Water-Glycol Fluids

These fluids contain water, glycol and a thickener. They provide the highest degree of fire protection. They are also compatible with the widest range of packing materials including those commonly used with petroleum oils. They should only be used, however, in systems operating at reservoir temperatures below 150°F.

Houghton's Houghto-Safe 200 and 600 Series are of this type and enjoy top acceptance and use by the armed services, as well as general industry. This wide-spread usage is due to important additives that provide *extra* anti-wear, rust inhibiting, anti-foam and metal deactivator properties to improve performance and increase pump life.

2. Phosphate-Ester Fluids

Fluids of this type are composed of straight phosphate esters and may contain small amounts of additives. These fluids can be used over the widest range of hydraulic pressures; they provide maximum lubricity for heavy bearing loads, and will stand up where ambient temperatures exceed 150°F. Packings used with these fluids must be Butyl, Butyl-Fabric or Polysulphide-impregnated Leather.

Houghton's Houghto-Safe 1000 Series are phosphate-ester fluids specially selected and compounded with additives to improve wear and rust resistance and add other proven operating benefits. Here again, Houghto-Safe 1000 Series has earned acceptance and is used on many military and space projects, as well as many of industry's toughest applications.

3. Emulsion Fluids

These fluids are either emulsions of water-in-oil (non-ionic) or oil-in-water (anionic). The following statements pertain to the water-in-oil type which are most widely used in industrial hydraulic systems.

Since these fluids are made of water and petroleum, they are compatible with standard Buna N rubber packings. They are also the lowest cost of all fire-resistant fluids. Their fire resistance is also the lowest of all three types; they should be used only in areas requiring a moderately safe fluid. The operating pressures of these fluids is generally limited to under 1000 psi.

Houghto-Safe 5000 Series designates Houghton's emulsion type fluid. It is a water-in-oil (non-ionic) fluid not affected by water hardness. Special additives are used to provide stability of the emulsion and to increase lubricity.

COMPARISON OF HYDRAULIC FLUIDS

Fluid Type	Viscosity Temperature Characteristics	Fire Resistance	Lubricity	Max. Fluid Temp. °F.	Relative Cost
Emulsion Fluids	Fair	Fair	Fair	See Note	1
Water-Glycol Fluids	Very Good	Excellent	Good	See Note	2
Phosphate-Ester Fluids	Poor	Good	Very Good	See Note	3

NOTE:—The Joint Industry Conference (JIC) Hydraulic Standards recommends the following where systems are operated continuously.

1. For water base fire-resistant fluids, the temperature of the fluid should be controlled so as not to exceed 120°F. at the pump inlet.
2. For other fluids, including petroleum oil, the temperature of the fluid should be controlled so as not to exceed 130°F. at the pump inlet.

For unusual system conditions where it is impossible to adhere to these reservoir temperature levels, the Houghton representative should be consulted.

For detailed information booklet describing all types of fire-resistant fluids, or help in selection, call your Houghton representative or write: E. F. Houghton & Co., 303 W. Lehigh Avenue, Philadelphia 33, Pa.

Houghton

INDUSTRY'S PARTNER IN PRODUCTION

Circle 599 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

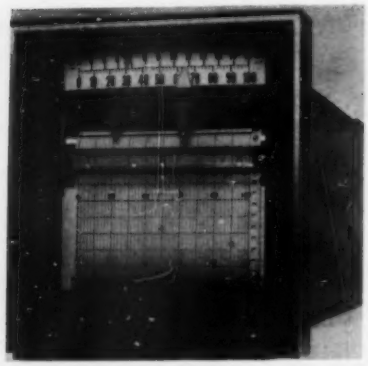
(Begins on page 190)

sule is available without charge to plant engineers. W-K-M Div., ACF Industries, Inc.

For details, circle 5 on Post Card

INSTRUMENTS "flip" over to automatic operation

Greatly simplified start-up and operation of industrial processes is announced for the PneumatiK Tel-O-Set line of miniature pneumatic instrumentation. Consisting of 12 major types of 4-in. indicating, recording and controlling devices, it makes possible manual-automatic control transfer without matching pressures. A flip of the lever



does it. Cascade control, the resetting of a set point of a primary controller by a secondary controller, becomes practical and convenient.

Other features include zero and damping adjustment without removal of recording chart drive mechanism; continuation of process control on automatic or manual control when recording or indicating chassis is removed; and true reset by-pass: In the Tel-O-Set line are one- and two-pen strip chart recorders without and with control; single- and two-station recording cascade control; one- and two- point indicators with and without control; a proportional plus reset controller, and a proportional plus reset plus rate controller. All operate over the usual range of 3 to 15 psi, may be combined with transmitter and final control. Specifications 1004-1, 2, 3 give data. Minneapolis-Honeywell Regulator Co.

For details, circle 6 on Post Card

CEILING PANEL provides economical 3-hr fire protection

Armstrong Fire Guard Nailing Panel protects structural steel joists from flame and heat for over 3 hr and helps to keep flames from spreading, manufacturer claims. Designed for fast, economical installation, the 2- by 5-ft panels can be fastened to standard-type nailing channels and end joists reinforced with clips. It can be used as a ceiling wherever appearance is not of primary concern, or as an upper ceiling in double-ceiling construction. Armstrong Cork Co.

For details, circle 7 on Post Card

PLASTIC LIGHT GUARDS resist atmospheric corrosion

The Kemlon Light Guard is announced as resistant to all atmospheric corrosion and also acid and chlorine vapors. The guard is molded from a 35 per cent glass-reinforced thermosetting plastic of high impact strength. Its resilient nature makes it applicable for use where swinging pipes and tools are a hazard to vapor tight receptacles. The guard may be used in temperatures to 350 F. It fits standard threaded bases and is available for lights up to 300 w. Keystone Engineering Co.

For details, circle 8 on Post Card

INSTRUMENT measures low temperature differences

Utilizing company's HO PowrLog Recorder for amplifying and recording, this instrument eliminates need for a complex pre-amplifier when measuring low temperature differences such as Btu output on hot water boilers or Btu removal by chilled water air conditioning systems. One of two standard assemblies is adjustable for a temperature difference range of 15 to 25 F; the other, for 50 to 200 F. Other applications are for measuring and control of humidity over narrow ranges by measuring difference between wet and dry bulb temperatures, measuring of the temperature rise across a pump and measuring of air heater efficiency. Hagan Chemicals & Controls, Inc.

For details, circle 9 on Post Card

PNEUMATIC COUPLINGS give longer service life

Dyna-Quip pneumatic couplings have design advantages said to extend life and offer installation convenience. Three types are available. Dyna-Quip, a ball type for limited quick disconnect service, has a hardened steel sleeve for heavy-duty use, and component parts of stainless steel. The Dyna-Matic, an automatic pin type, has hardened stainless steel pins resting against a hardened stainless backup ring, and stainless steel components. Dyna-Con, a coupling and valve, claimed to have the highest capacity of any pneumatic coupling, is easy to connect, having no line pressure or valve spring resistance. Its twist safety lock guards against accidental uncoupling. Dyna-Quip Div., Stile-Craft Mfg. Inc.

For details, circle 10 on Post Card

LANE MARKERS, low cost, easy to store, carry

For designating lanes and closed areas, these high visibility markers are composed of interchangeable yellow tubes set in separate 10-in. square black

molded bases. The tubes come in heights from 12 to 72 in. The units have good impact resistance and the molded-in colors cannot wear or flake off. These markers occupy less carrying and storage space than conventional cones, and will accommodate standard accessory flags, warning signs or flashers. Stokes Molded Products.

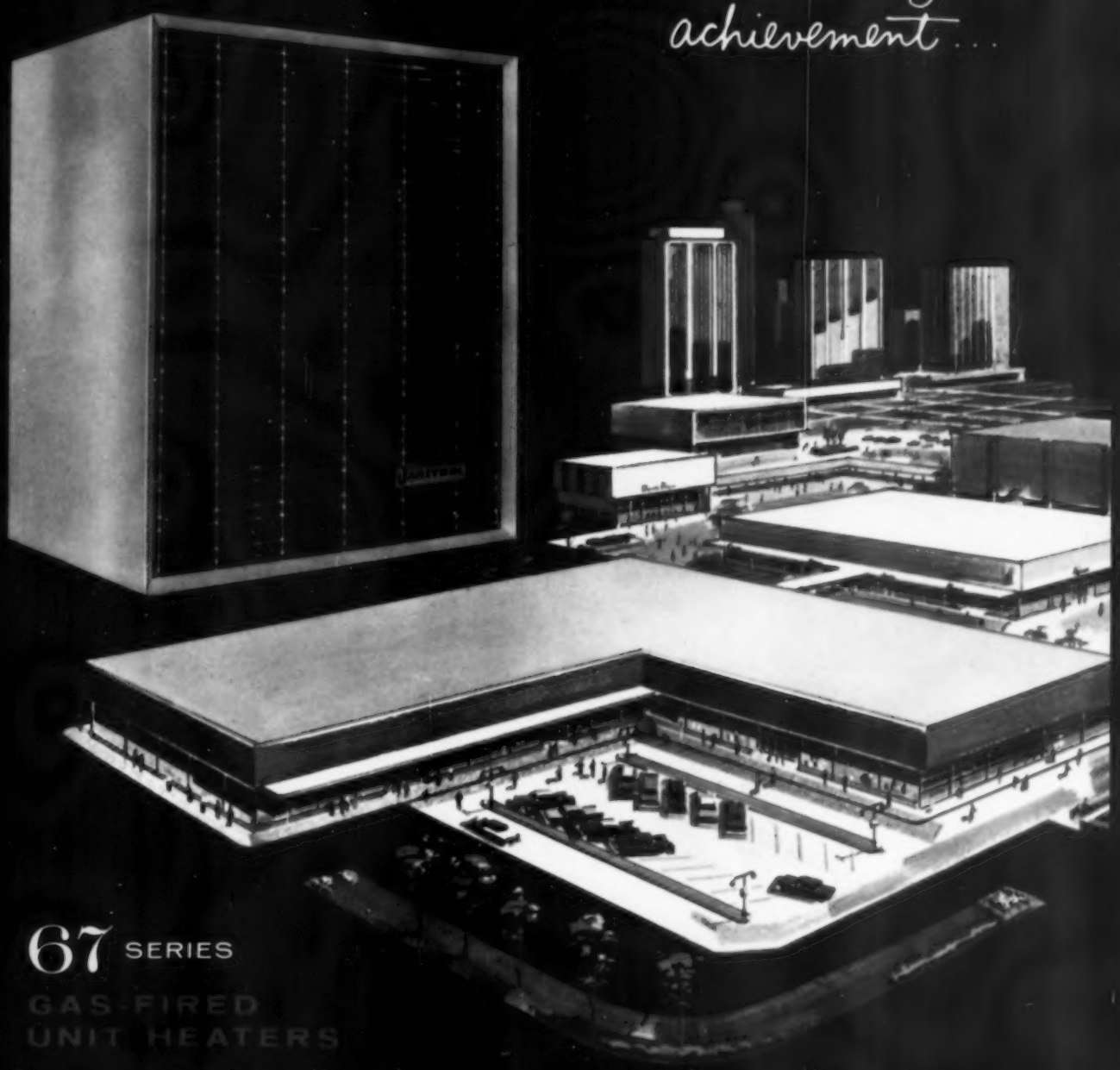
For details, circle 11 on Post Card

COMPACT FILTER removes tastes, odors from water

Objectionable tastes and odors are removed from water by passing it through activated carbon particles in the AC-7 Filter. Carbon is contained in a Duo-Guard tank, a chemical-resistive, seamless plastic inner shell with

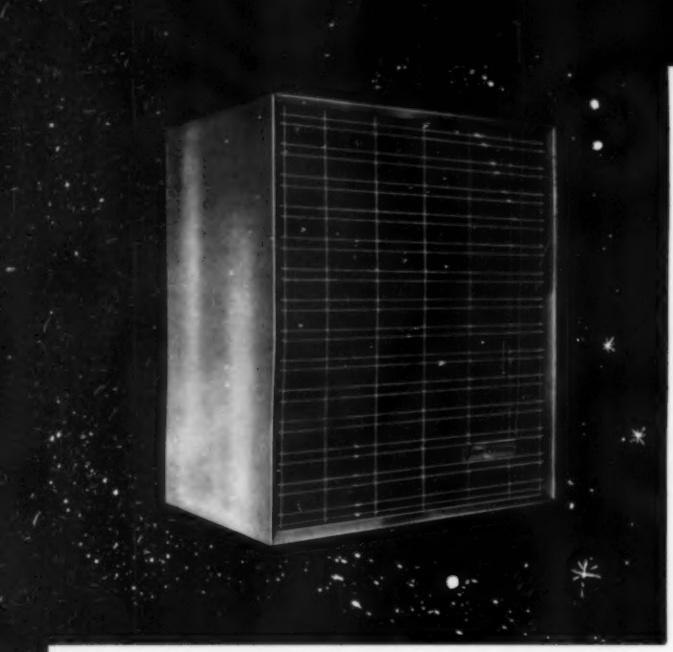
Circle 600 on postcard, page 33

JANITROL presents a dramatically new achievement...



67 SERIES
GAS-FIRED
UNIT HEATERS

UNPRECEDENTED STYLING, PERFORMANCE AND DURABILITY TO MEET THE MODERN TREND IN ARCHITECTURAL DESIGN



provide the ultimate in quality and economy

new JANITROL GAS-FIRED

commercial & industrial heating equipment

ALL NEW! JANITROL 67 SERIES UNIT HEATERS FEATURING... STELLAR NEW STYLING, PERFORMANCE AND DURABILITY!

New Janitrol 67 Series Unit Heaters are unusually handsome . . . incredibly quiet and efficient. They bring you, for the first time in unit heater history, distinctive appearance you can recommend for the smartest business setting. And they offer in even greater measure the traditional Janitrol quality and dependability in heating.

Their clean, crisp "look" is a departure from the crude, cumbersome industrial appearance of yesterday. Modern machine tools, trucks and structures have evolved as attractive, functional designs. And now, Janitrol sets the pace in unit heater styling!

The draft hood opening and adjustable louvers are concealed by the beautifully styled gold-tone grille. The rear combustion air inlet permits use of a solid bottom panel . . . eliminates any possibility of obstruction to combustion air intake.

Inside, design progress is equally significant. Yet every part is proven . . . every safety feature is included. Result? Performance no other unit heater can duplicate.

Naturally, the "heating heart" of every new Janitrol is the famous Janitrol Multi-Thermex heat exchanger with this unchallenged record for durability and low maintenance: among nearly three million heat exchanger tubes produced since 1940, replacements for all causes have run less than ¼ of 1%.

Investigate the many exclusive advantages of Janitrol 67 Series Unit Heaters for jobs you specify or install. Let them help build your reputation for quality.

FEATURES THAT MAKE ALL OTHER UNIT HEATERS OLD-FASHIONED!

New "sheer look" styling—Beautiful Phoenix Beige finish • New gold-tone grille. Conceals louvers and draft hood opening • Low overall height • Automatic controls—Fully accessible • Factory-fired • Low Voltage Gas Controls—Standard • Low Voltage Sensitive Thermostat—Standard • Limit control—interrupts control circuits and shuts off fuel if unit temperature becomes excessive • Thermopilot Shut-off. Shuts off all gas, including pilot, in event of pilot flame failure • Automatic Pilot. Exclusive Janitrol low Btu. non-linting design • Quiet air delivery. Acceptable for schools and other applications where conventional units are too noisy • Motor prelubricated for 5 years • Built-in Draft Hood. Removable, provides full access to heat exchanger. Protects burners from abnormal up or down draft • Combustion air inlet. At bottom rear, through control enclosure. Controls constantly cooled by combustion air stream. Eliminates cross draft on burners • Ampli-Fire Ribbon Flame Burners. No flame contact on metal. Removable, with non-linting air shutters featuring thumb-screw adjustment. Eleven models from 30,000 to 250,000 Btu/hr.

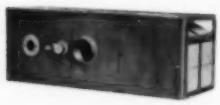
MEET EVERY COMMERCIAL AND INDUSTRIAL HEATING NEED FROM JANITROL'S BROAD LINE

GAS-FIRED DUCT-FURNACES
Install in a duct where air is circulated by separate blower. Adaptable for use with cooling. Two sizes: 200,000 and 300,000 Btu/hr. input—may be combined to provide capacity from 200,000 Btu/hr. up, in increments of 100,000 Btu/hr. input. Six sizes, from 50,000 to 225,000 Btu/hr. in Duct 55 models.

BLOWER-TYPE UNIT HEATER
Allows air delivery from greater heights and against greater static pressures. Models with exposed or enclosed blowers. A.G.A. approved as low and high static-type blower unit heater for air delivery to duct system up to 1.0 in. W.C. external static. Heat sections factory assembled. Sizes: 300,000, 400,000 and 500,000 Btu/hr. input.

FLOOR-TYPE UNIT HEATER
Cold air drawn from floor level is heated, filtered and discharged horizontally overhead. Quiet, clean, carefree—ideal for offices, restaurants, stores, labs, etc., requiring a compact unit.

HEAVY DUTY BLOWER HEATERS
For unit heating, central heating and air conditioning. Wide range of standard blowers and motors assures correct air delivery and temperature rise in each application. Factory assembled and tested. Capacities from 250,000 Btu to 1,750,000 Btu/hr. input.



HORIZONTAL OIL UNIT HEATER
For suspension overhead. Saves floor space. Compact, efficient, low-maintenance design clean and quiet in operation. May also be used to feed duct system. Choice of sizes from 84,000 to 250,000 Btu/hr. output to meet all needs.

helpful data for
ARCHITECTS, CONTRACTORS AND ENGINEERS
write today for complete information on Janitrol units for heating with clean, economical gas in buildings of every type. There's no obligation.

JANITROL
HEATING AND AIR CONDITIONING
A Division of Midland-Ross Corporation
Columbus 16, Ohio • In Canada: Moffats Ltd., Toronto 15

Also Makers of Surface Industrial Furnaces, Kathabar Humidity Conditioning, Janitrol Residential Heating and Cooling Equipment.

PLANT ENGINEERING EQUIPMENT

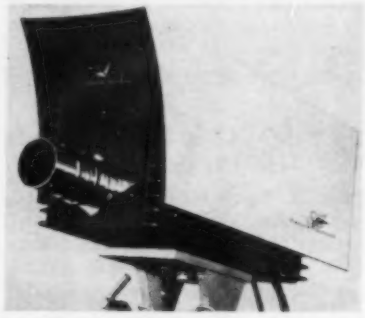
(Begins on page 190)

a separate aluminum outer shell. With only two connections to make, the compact, lightweight unit is simple to install in any type plumbing system. Bruner Corp.

For details, circle 12 on Post Card

CLOSED CIRCUIT TV—just "set and forget"

The Hawk 401, a weatherproof, dustproof television system, can be installed in exposed, hot or cold, inaccessible locations and will perform without care or attention, manufacturer states. The 401 operates successfully over the wid-



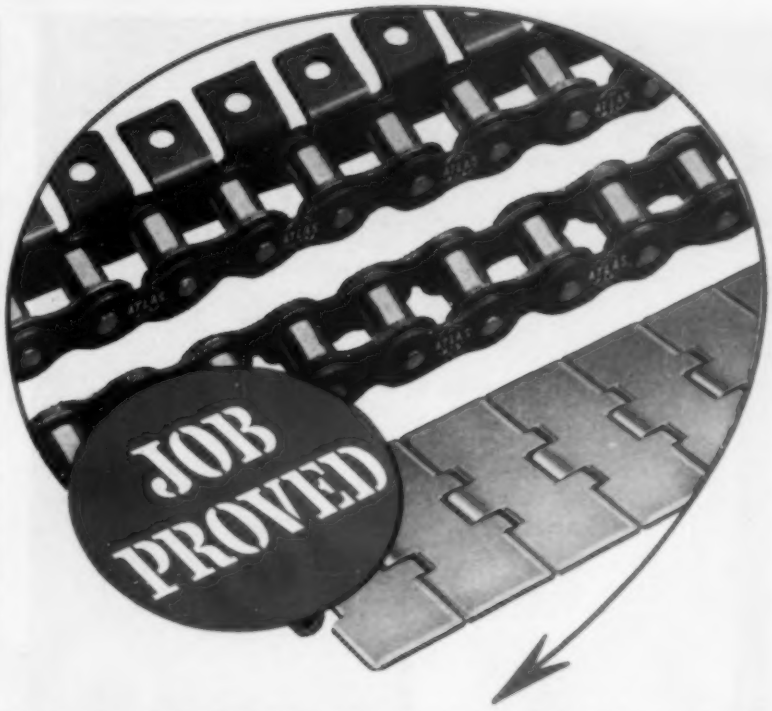
est possible range of light, company says, with ample clarity provided for surveillance requirements. It operates from an ordinary 110-v a-c outlet, weighs 23 lb, is 19½ in. long. Any standard 16mm mount lens may be used with it. Diamond Electronics.

For details, circle 13 on Post Card

WELDING SYSTEM for thin gage materials

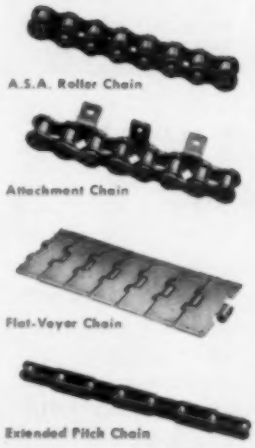
Exceptional speed and versatility at low cost are reported for the Westing-Arc SA-200 system, which includes

a 200-amp silicon diode rectifier power source, compact wire drive system with wide feed range, and a new straight-



FOR EVERY INDUSTRIAL JOB

ATLAS CHAIN



PROVED AND APPROVED ON ALL TYPES OF TRANSMISSION AND CONVEYOR INSTALLATIONS

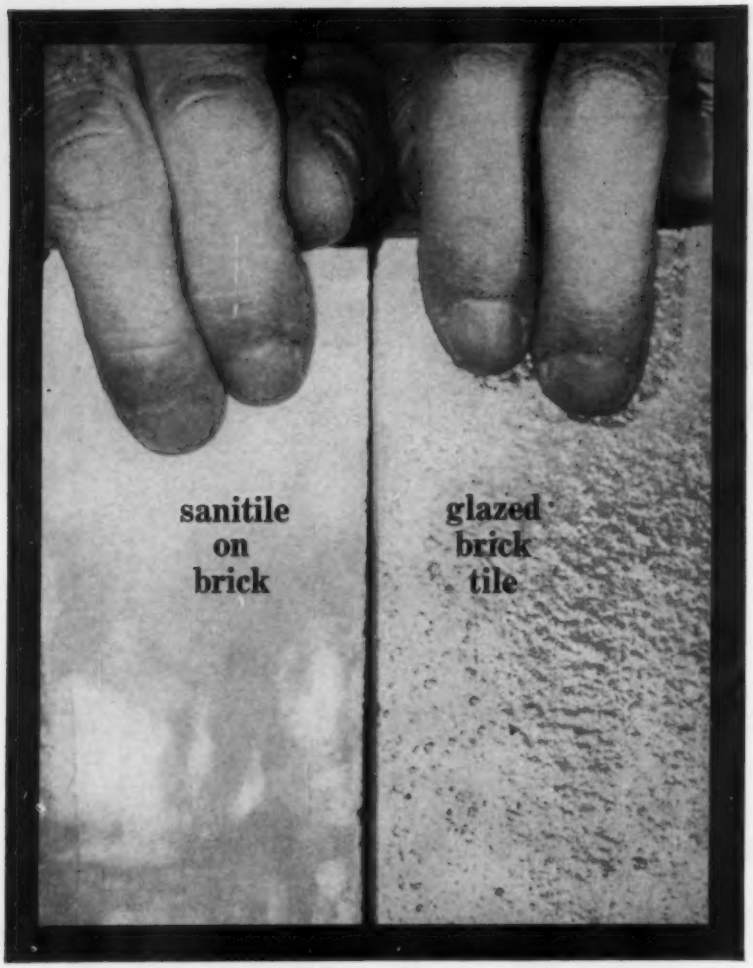
When you specify Atlas Chain you are certain of maximum performance. Every type of Atlas Chain has been "Job Proved" throughout industry for peak operating efficiency. Every length pre-tested in modern laboratories for unsurpassed quality.

From tiny timers to rugged drives... from fractional horsepower motors to mighty giants... for conveying paper boxes or corrosive liquid containers ... there's an Atlas Chain to fit your most exacting specifications. Singles or multiples... regular or heavy duty... standard or extended pitch... steel, stainless steel, bronze or Electrolized... or Flat-Veyor conveyor chain Atlas makes them in all sizes to meet or exceed A.S.A. requirements.

On present machines or planned drives specify Atlas "Job Proved" Chain for lower operating costs, less servicing and more production. For complete details and catalog contact your nearest Atlas distributor, or write direct to...

ATLAS CHAIN & MANUFACTURING COMPANY
Subsidiary Prudential Industries, Inc.
WEST PITTSTON, PA.

Circle 601 on postcard, page 33



GLEAMING SANITILE WALLS
at 1/15th the cost of tile

SANITILE transforms your plant into a gleaming show place... creates a sparkling, tile-like surface over present walls and ceilings... produces the sanitary advantage of tile at 1/15th the cost of tile. Sanitile is applied by brush, spray or roller by your own help... without processing stoppage... saves the cost and inconvenience of 2 to 4 repaintings. Used throughout the world by leading food processors.

SANITILE meets exacting sanitary requirements for smooth, washable, hard surfaces over cement block, brick, plaster and composition board. Sanitile resists steam hosing, condensation, water, acids, alkalies, oils and greases... checks and resists fungus, mould and bacteria. Write for booklet AIA 23G, *The Master Mechanics Co., Cleveland 28, Ohio, or The Master Mechanics Chemicals Co. (Canada) Ltd., Toronto 14, Ontario.*

THE MASTER MECHANICS COMPANY

Circle 602 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

through torch. The power source, company's Type RCV Welder, has features that suit it for fine electrode wire production welding of thinner gage materials. The wire drive system has a range of 90 to 424 ipm with standard gearing, can be modified to provide speeds to 1170 ipm. The torch, described as the lightest, coolest and most maneuverable available, weighs only 22 oz and accommodates wire sizes in steel or stainless from 0.025 to 0.047 in. It's rated at 100 per cent duty cycle at 200 amp. This straight-through torch and the wire drive systems may be had separately for use with present equipment modified to make use of the equipment. Westinghouse Electric Corp.

For details, circle 14 on Post Card

DRY-SOLIDS PUMP speeds rail car unloading

Fuller-Kompact Model 62, a fluidized-solids pump, is designed for easy connection to hopper bottom car outlets. It is suggested for pneumatic unloading Portland cement, limestone, clay

and similar materials from rail cars to storage bin, or transferring materials from rail car to truck or trailer. It's tailored for easy installation beneath rails. No extensive track pit is required—normally just a trench only 17 in. deep below bottom of rail. The pump is available with V-belt or direct drive. Pump and air supply are integrated into package form to facilitate selection of proper power and air combinations. The pump can convey Portland cement at rates up to 300 bbl/hr. for conveying distances up to 125 ft. Fuller Co.

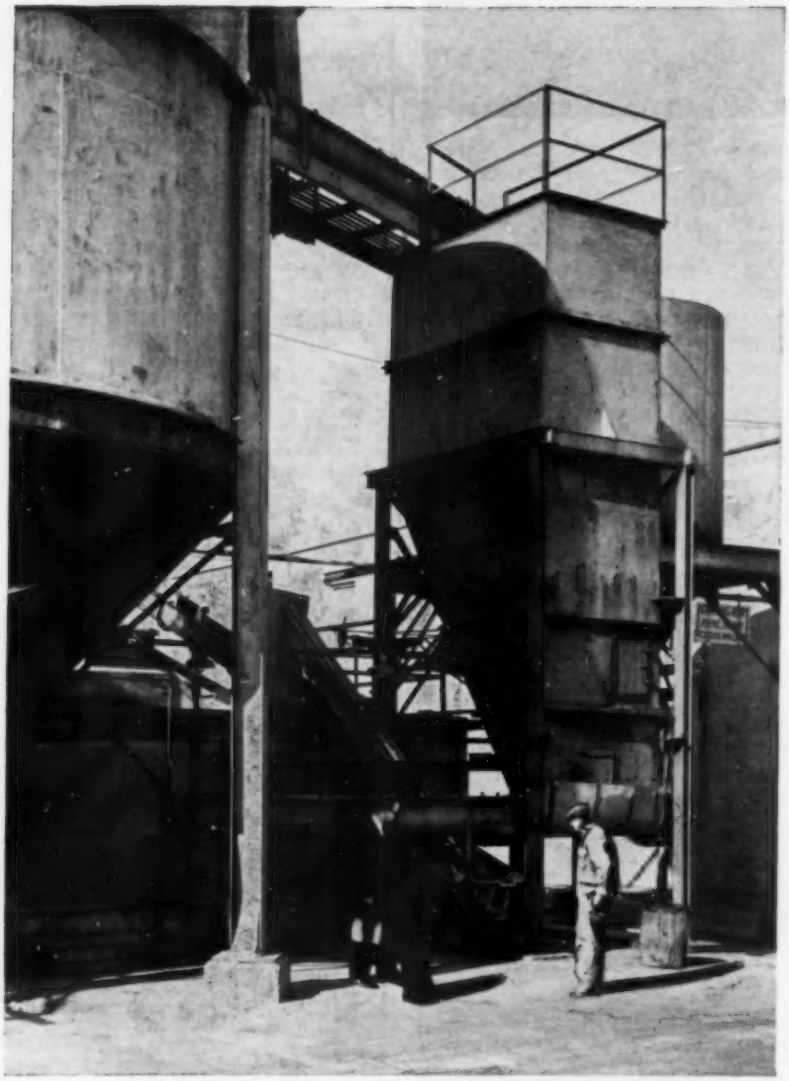
For details, circle 15 on Post Card

GAUGE-SAVER VALVES stop flow at excess pressures

For use in hydraulic, fuel or pneumatic systems, this in-line gauge saver automatically stops flow to gauge at

Jeffrey helps promote distributor-customer teamwork for efficient service

Allen Pingpank, Jeffrey Sales Engineer, (at left) discusses chains and stocking needs with John Battel, Partner, General Chain & Belt Company, New York.



Above, from left to right: Allen Pingpank, John Battel and Edward Moog, Chief Engineer of Farmers Feed Co., check out equipment at the feed processing plant.

Three is not a crowd when it comes to equipment replacement. Farmers Feed Company, Brooklyn, New York, finds that out every time there is a need for fast service on replacement parts. Farmers Feed Company has built a tight, three-way team between itself, General Chain & Belt Company, New York distributor and Jeffrey.

For example, operations at Farmers Feed often call for replacement bucket elevators, spiral and chain conveyors, take-up bearings and sprockets. General Chain & Belt has exactly what this customer needs because close work with Jeffrey in selecting and maintaining stocks made it possible.

Jeffrey engineers work closely with every distributor, custom-tailoring distributor service to match customer needs. Providing well-known Jeffrey quality in all these products is no problem when you have alert, cooperative field-work like this.

To take advantage of this kind of customer-distributor-manufacturer teamwork, just call your own nearby Jeffrey distributor. If his stocks don't aready provide for your needs, you can be sure he'll put Jeffrey quality to work for you fast. The Jeffrey Manufacturing Company, 905 North Fourth St., Columbus 16, Ohio.

If it's conveyed, processed or mined, it's a job for Jeffrey.

JEFFREY

Circle 603 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

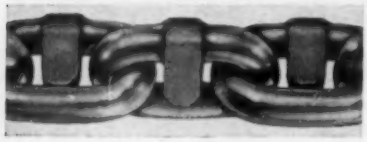
(Begins on page 190)

excess pressures. The low cost units are available in aluminum and stainless steel (at about $8 and $10), and are adjustable from 50 to 5000 psi. They are machined from ⅞ hexagon stock, are 2 in. long including ½-14 NPT connections at each end. Fisher Controls Inc.

For details, circle 16 on Post Card

CHAIN resists high temperatures, acid concentration

ACCO Full Stud Acid Pickle Chain has a stud incorporated into each link to resist deformation under load, increase load limit 31 per cent and in-

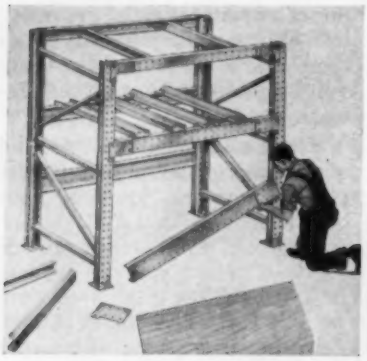


crease chain life. It is claimed non-kinking, and resistant to concentrations of sulphuric acid to 20 per cent and temperatures to 200 F. Continuous lengths come in sizes to ¾ in. and in various chain assemblies. American Chain Div., American Chain & Cable Co., Inc.

For details, circle 17 on Post Card

STORAGE RACK for pallet or shelf, assembles fast

Series 4000 Bild-A-Rack requires no special tools, equipment, cutting, or welding. It comes packaged for assembly in a few minutes. It is fabricated



of galvanized steel formed channel with upright capacity of 10,600 lb for 144-in. height. Beam capacities are available to 4200 lb for each pair of shelves to a span of 106 in. The Paltier Corp.

For details, circle 18 on Post Card

LATTICE BRAID PACKINGS are Teflon-impregnated

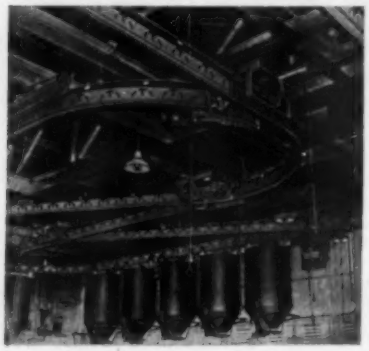
Lattice Braid Packings (Styles 5875 and 5881 contain more than 30 percent Teflon by weight. They are said to provide greater stability under temperature changes, resistance to glazing,

minimum swelling, reduced friction and wear plus resistance to chemicals and corrosives—at about 40 per cent reduction in cost over other Teflon treated packings. They are designed for food, paper, chemical processing and other industries where packing itself must withstand reactive liquids and where product processed must not be contaminated. Style 5881 is a blue asbestos type for strong caustics and acids; Style 5875 is a white asbestos type for general chemical service. Temperature ranges are -90 to 500 F. Garlock Inc.

For details, circle 19 on Post Card

OVERHEAD TRACK takes heavy, long-span loads

Tarca Track is designed to withstand heavy, swinging, jerky loads and provide a smooth trouble-free road for overhead movement of materials. The track consists of steel flange and web, and a rolled high carbon alloy steel rail, welded continuously from end to end to form a combined section free of stress concentrations. Rail has a hard, flat, raised tread or running surface for smooth operation of cranes. Where distances between track sup-



G-B SNAP*ON DISTRIBUTORS

AKRON, Ohio, The Asbestos Supply Co.
ALBANY, Ga., Industry Insulation Co.
ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
Morrison Supply Co.
ANDERSON, S. C., Building Material & Equipment Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
Parker-Rice Insulation Co.
AUGUSTA, Ga., The Noland Co.
AUSTIN, Tex., Cinbar Engineering Co.
BALTIMORE, Md., Leroy Insulation Co.
BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Packing Co.
BEAUMONT, Tex., Coburn Supply Co., Inc.
Solar Supply Co.
BILLINGS, Mont., Big Horn Supply, Inc.
BIRMINGHAM, Ala., Reynolds Aluminum Supply Co.
Shook & Fletcher Supply Co.
BORGER, Tex., Western Chemical & Supply Co.
BOSTON, Mass., Homans-Kohler, Inc.
BRIDGEPORT, Conn., Robert A. Keasbey Co., Inc.
BRUNSWICK, Ga., Baker Bros., Inc.
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CHAMPAIGN, Ill., The Lewis-David Co.
CHARLESTON, S. C., Baker Bros., Inc.
CHARLESTON, W. Va., Asbestos & Insulating Co.
CHARLOTTE, N. C., D & B Insulation Co.
CHATTANOOGA, Tenn., The Noland Co.
CHICAGO, Ill., E. C. Carlson Co.
Culberg Asbestos & Cork Co.
CHRISTOPHER, Ill., Hoe Supply Co.
CLEVELAND, Ohio, Ohio Asbestos & Insulation Co.
COLUMBUS, Ohio, Santeler Brothers; Culberg of Ohio
CORPUS CHRISTI, Tex., Precision Insulation Co.
DALLAS, Tex., Acme Insulation & Supply Co.
Electrical Supply Corp.
Payne-Ladewig, Inc.
DAVENPORT, Iowa, Republic Electric Co.
DAYTONA BEACH, Fla., B & F Insulation Co.
DECATUR, Ill., The Lewis-David Co.
DENVER, Colo., Plateau Supply Co.
DES MOINES, Iowa, Iowa Asbestos Company, Inc.
DETROIT, Mich., The Walter Rankin Co.
EL PASO, Tex., Insulation Specialties Co.
M&M Refrigeration & Sply. Co.
ERIE, Pa., Loco-McMullen Co.
EVANSVILLE, Ind., Geo. Koch Sons, Inc.
FALCONER, N. Y., Laco Roofing
FT. SMITH, Ark., Ball Distributing & Engineering Co.
FT. WAYNE, Ind., M. H. Hilt, Inc.
FT. WORTH, Tex., Bracken Co.
GAINESVILLE, Fla., Baker Bros., Inc.
GRAND RAPIDS, Mich., M. S. Knee Co.
GREENSBORO, N. C., Starr Davis Co., Inc.
GULFPORT, Miss., Paine Supply Co.
HONOLULU, Hawaii, Parker-Fallis Insulation Co., Inc.
HOUSTON, Tex., Precision Insulation Co.
INDIANAPOLIS, Ind., Lynn Lumber & Supply Co.
IRON MOUNTAIN, Mich., Champion, Inc.
JACKSON, Miss., Paine Refrigeration Supply Co.
JACKSONVILLE, Fla., Baker Bros., Inc.
Eckles Distributors, Inc.
Farber Sheet Metal Works
Reynolds Aluminum Supply Co.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Mo., Central Supply Co.
Insulation & Acoustical Specialties, Inc.
Kelley Asbestos Prod.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
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KNOXVILLE, Tenn., Willis Supply Co.
LAKE CHARLES, La., Coburn Supply Co., Inc.
Solar Supply Co.
LOS ANGELES, Calif., Accurate Insulation Co., Inc.
Western Fibrous Glass Products Co.
LOUISVILLE, Ky., General Insulation & Roofing Co.
LUBBOCK, Tex., Mechanical Equipment
Morrison Supply Co.
MACON, Ga., Industry Insulation Co.
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Southern Metal Products Co.
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MOBILE, Ala., Shook & Fletcher Insulation
MONTGOMERY, Ala., Shook & Fletcher Insulation
MOORHEAD, Minn., Fargo-Moorhead Insulation Co.
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NEW YORK, N. Y., Eastern Steam Specialty Co.
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OMAHA, Nebr., Cardinal Supply & Mfg. Co.
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PHOENIX, Ariz., Williams Insulation Co.
PITTSBURGH, Pa., Dravo Corp., Keystone Div.
PORT ARTHUR, Tex., Coburn Supply Co., Inc.
PORTLAND, Me., Eastern Glass Co., Inc.
PORTLAND, Ore., Western Fibrous Glass Products Co.
RALEIGH, N. C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RED BANK, N. J., Altex Pipe & Supply Co.
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
ROCKFORD, Ill., Mott Brothers Co.
SACRAMENTO, Calif., The Brookman Co.
SALT LAKE CITY, Utah, Bullough Asbestos Sup. Co.
SAN ANTONIO, Tex., San Antonio Machine & Supply Co.
SAN DIEGO, Calif., Western Fibrous Glass Products Co.
SAN FRANCISCO, Calif., Western Fibrous Glass Prod. Co.
The Brookman Co.
SAVANNAH, Ga., Baker Bros., Inc.; The Brower Co.
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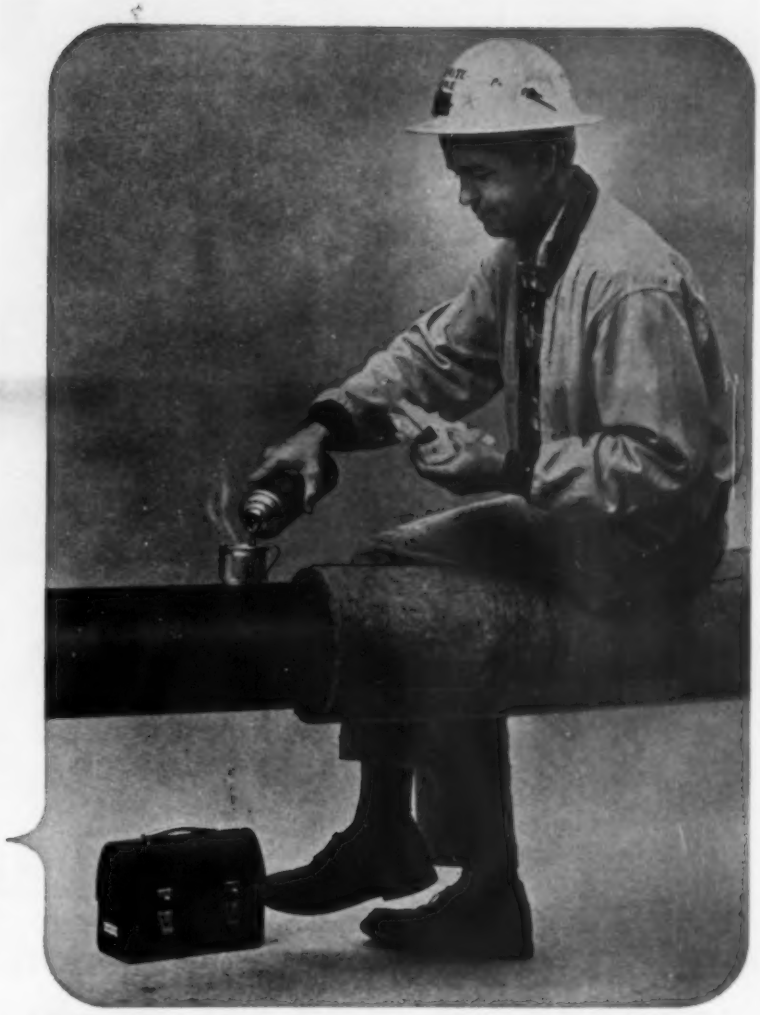
HERE'S WHY G-B SNAP*ON® GLASS FIBER PIPE INSULATION OUT-PERFORMS ALL OTHER PIPE COVERINGS

FOR CHILLED AND HEATED PIPE FROM SUB-ZERO TO 350° F.—INDOORS OR OUT— G-B SNAP*ON HAS NO SUPERIOR. AND HERE'S WHY:



HIGH IN THERMAL EFFICIENCY. A heated pipe may keep this workman's coffee hot, but it's a cinch that he won't get a "hot seat" when he's protected by G-B Snap*On. The "K" factors of this all-glass-fiber insulation are second to none among all general purpose pipe insulations.

IMMUNE TO DAMAGE. Tough to beat and tough to abuse — that's G-B Snap*On. There's just no knocking out the highly resilient glass fibers that go into the construction of G-B Snap*On. Even when accidentally crushed or stepped on, it springs back to its original shape.

EASY, FAST TO INSTALL. Thanks to its snap-hinge action, G-B Snap*On slips over pipe and snaps back to its original cylindrical shape in one easy motion. Once in place, G-B Snap*On provides permanent insulation protection. It does not rot, corrode, mildew or otherwise deteriorate.

VARIETY OF SIZES. The only one-piece glass fiber pipe insulation available in sizes over 32" IPS, G-B Snap*On is also available in diameters down to copper tubing . . . varying thicknesses . . . plain or with a variety of factory-applied facings for use indoors or out.

WRITE FOR COMPLETE PRODUCT INFORMATION

GUSTIN-BACON *Manufacturing Company*

GUSTIN gb BACON

232 West 10th St., Kansas City, Mo.

Circle 604 on postcard, page 33

Operator (at right) applies fiber glass-binder mix to preform screen. Helper is removing cured preform which has just come out of oven.

Newly made preform travels into first curing zone as empty screen moves to application station.

NEW FIBER GLASS PREFORMER-CURING OVEN

WORK ROTATES... PRODUCTION IS DOUBLED

With Sly's new Preformer-Curing Oven, Plastic Products Corporation, Bedford Heights, Ohio, produces finished fiber glass preforms on the average of *one a minute*. Production rate of the preformed shapes, which are used as reinforcement in a range of plastic products, is twice that of the previous method.

Sly design insures a better product as far as both curing and shape retention are concerned. Heavy manual labor is eliminated. And the installation takes up a space that is only 11 feet square.

Sly has applied the principle of the familiar revolving door to make all operations continuous. At the application station the fiber glass-binder mixture is sprayed onto the preform screen. The newly made preform is then rotated successively to the first curing chamber, the second curing chamber, and finally the unload station.

Sly designs ovens for every need. Send us your requirements. Put our experience to work for you. And write for Bulletin 200.

THE W. W. SLY MANUFACTURING CO.
4600 Train Avenue • Cleveland 1, Ohio • Offices in Principal Cities

Circle 605 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

ports are great, the new track reduces or eliminates need for special structural framework. For crane bridges, single-girder 3-ton cranes or double-girder 5-ton cranes can be made for operation on runways up to 100-ft centers. Tracks can be used for hand-power or electrified installation, come in sizes from 8 to 20 in. deep, with special sizes on request. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

For details, circle 20 on Post Card

EPOXY ADHESIVE seals joints permanently

Epon Pipelock 924, an epoxy adhesive with a breakout torque of over 7000 ft lb on a 2⅞-in. tubing joint and a 24-hr

setting time, joins and seals steel pipe joints. It resists high temperatures, salt water, steam and mud. As a result, it can reduce drilling costs by eliminating welding. Pipelock consists of a paste and a liquid hardener which blend easily at 0 F. Pre-packaging in exact amounts simplifies preparation. When mixed properly the adhesive turns red and will then be usable for up to 40 min at 70 F. Shell Chemical Co.

For details, circle 21 on Post Card

Use the Reader Service Cards provided on pages 33-34 to ask for more information on this equipment. Circle item numbers of products in which you are interested.

SAFETY DEVICE holds fluorescent lamps in place

Lamp-Lock is a clip-on device which fits all standard fluorescent fixture sockets with or without the lamp installed. Hinged wire retainer clips are pulled down over the socket and under

SAFETY...specify Alan Wood floor plate

Whatever your safety problem underfoot, Alan Wood has the floor plate to meet the need—Super Diamond for safe footing in usual locations – A. W. Algrip for use where oils, greases, fats, printing ink mist or other materials cause slipping hazards. Both are durable and long wearing . . . easy to install . . . simple to maintain.

SUPER DIAMOND—rugged, heavy-duty floor plate with a unique pattern arrangement that is easy to match at any point, allows bending or cutting wherever desired. Super Diamond is easily and quickly welded with ordinary equipment . . . easily swept, hosed or mopped, from any direction—drains free, with no pockets to hold dirt.

A. W. ALGRIP—world's first and only abrasive rolled steel floor plate, made by a patented process in which an abrasive is embedded to a controlled depth . . . becoming an integral part of the steel plate, and providing lasting safety. A. W. Algrip is approved for safety by Underwriters' Laboratories.

Both Super Diamond and A. W. Algrip are readily available from Steel Service Centers across the country. Send for complete information on how one of these Alan Wood safety floor plates can solve your particular safety problems . . . just mail the coupon below.

ALAN WOOD STEEL COMPANY

Conshohocken, Pa. • STEEL PRODUCERS WITH THE CUSTOMER IN MIND

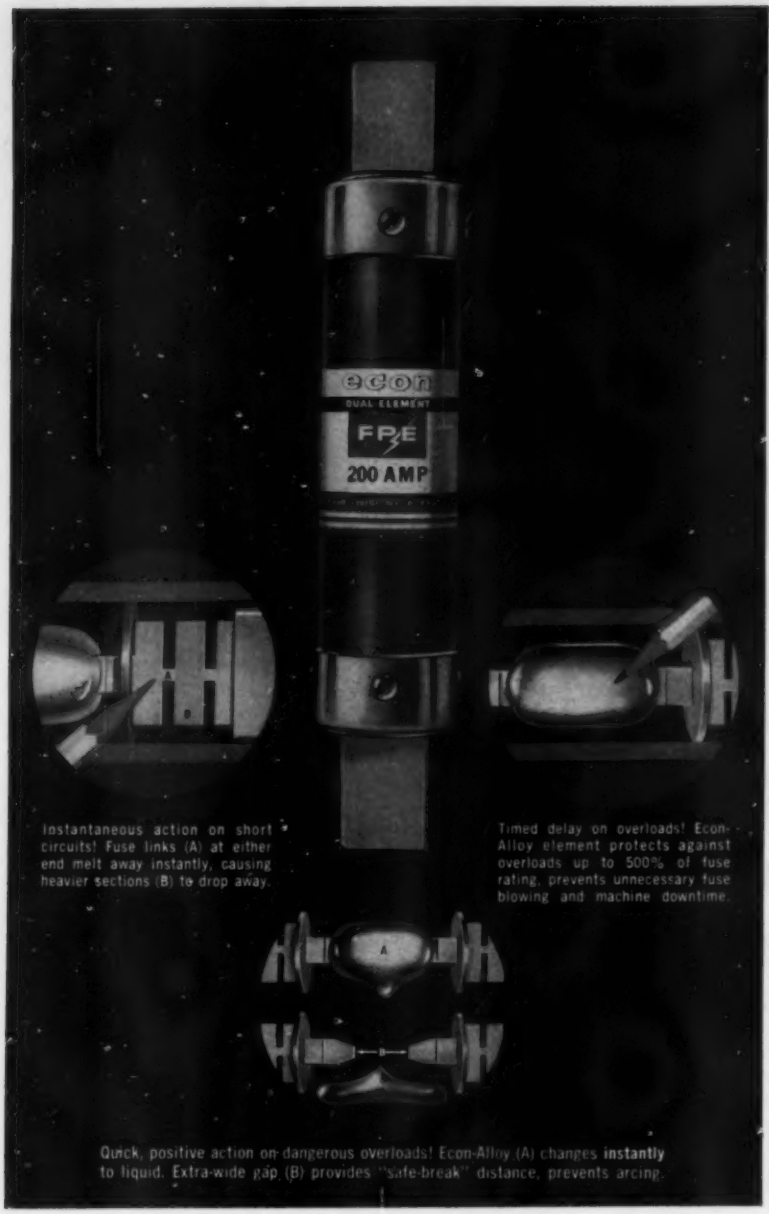
DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada: A. C. Leslie & Co., Ltd.

ALAN WOOD STEEL CO.
Conshohocken, Pa.

For safety's sake, please send your bulletin on:
☐ **Super Diamond floor plate** ☐ **A. W. Algrip floor plate**

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

Circle 606 on postcard, page 33


econ
DUAL ELEMENT
FP/E
200 AMP
Instantaneous action on short circuits! Fuse links (A) at either end melt away instantly, causing heavier sections (B) to drop away.
Timed delay on overloads! Econ-Alloy element protects against overloads up to 500% of fuse rating, prevents unnecessary fuse blowing and machine downtime.
Quick, positive action on dangerous overloads! Econ-Alloy (A) changes instantly to liquid. Extra-wide gap (B) provides "safe-break" distance, prevents arcing.

it blows!

(but only when it's supposed to)

On a short circuit, an Econ® dual-element fuse blows instantly. However, on an overload it blows only when the pre-determined heat and time limits are reached—never too early, never too late! This unparalleled consistency is possible because the Econ fuse has an exclusive eutectic thermal-alloy element acting as a heat-sensing device.

Econ's eutectic alloy, laboratory controlled from production to utilization, operates on the heat created by the over-current. Result—more dependable operation, lower fuse replacement costs and reduced downtime on machinery.

What's more, ECON dual-element fuses are certified by Electrical Testing Laboratories, Inc., to interrupt in excess of 100,000 RMS amperes! ECON dual element fuses are another big reason why, when it comes to fused circuit protection, it pays to "Remember to Use Economy Fuse!"

FP/E **ECONOMY FUSE DIVISION,** Des Plaines, Illinois
FEDERAL PACIFIC ELECTRIC COMPANY

FREE! Complete 12-page fuse catalog and pocket-sized fuse selector for motor protection.
Circle 607 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

the ends of lamp to clamp it firmly in position. By applying slight pressure on fluorescent tube's end caps, Lamp-Locks are said to maintain proper contact between lamp and socket terminals. Sun-Lite Mfg. Co.

For details, circle 22 on Post Card

FLOW INDICATOR with built-in adjustable alarm

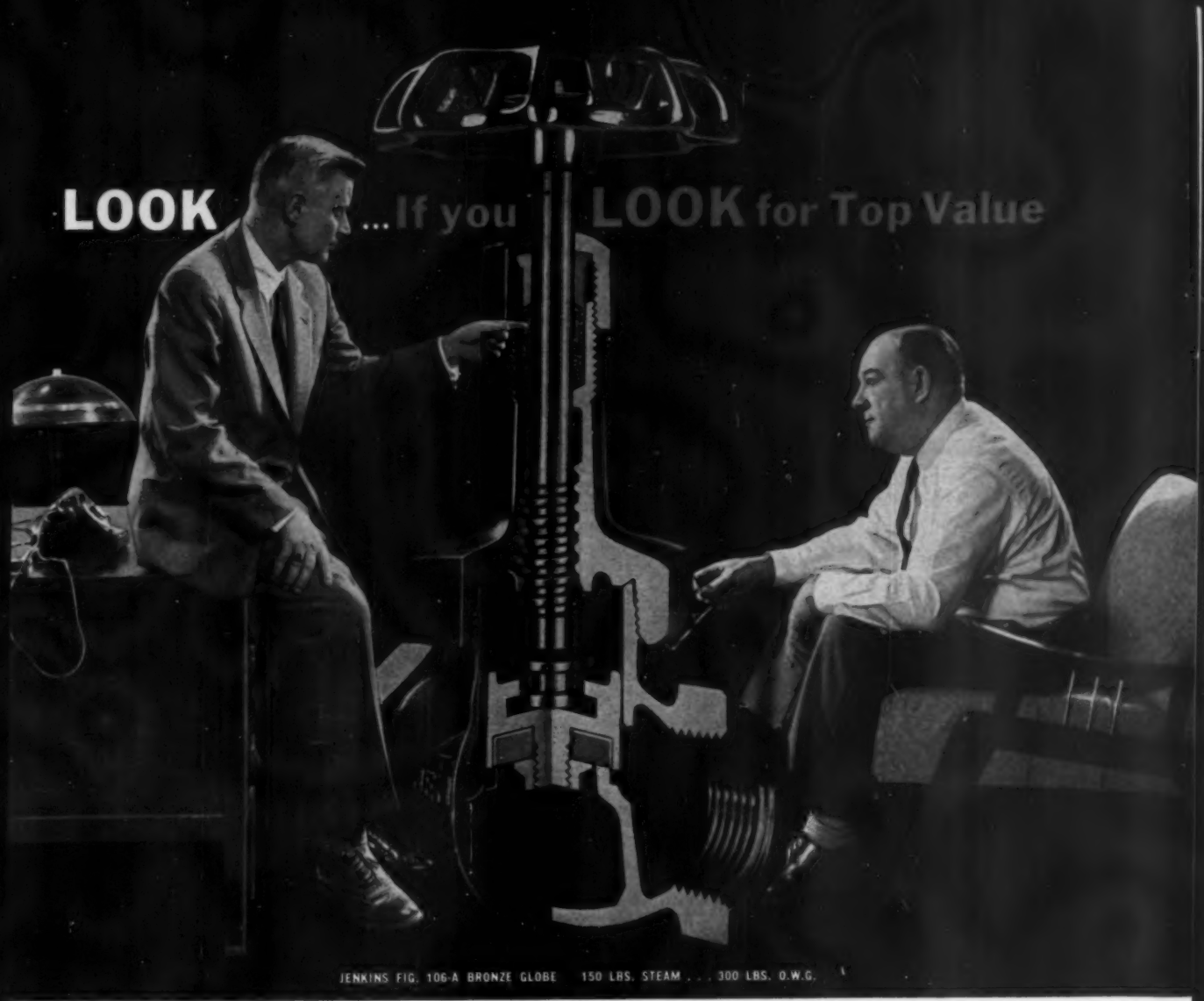
The Flo-Eye Indicator Alarm (Fig. 1885-CDA) incorporates an alarm into a flow indicator mounted in a water-

proof housing. It is made of brass for ½-in. pipe connections. A plug rises and falls with the flow rate and operates an alarm switch adjustable in a range to 10 gpm. Unit sells for about $50. Schutte & Koerting Co.

For details, circle 23 on Post Card

ANALOG COMPUTERS for on-line process control

Computers in the PC-12 line are assembled from stock solid-state modular components. These computers simultaneously accept several inputs and compute several outputs based on complex mathematical relationships which apply to the particular process. They can be used in closed loop control, or as advisory devices. Components are designed to meet typical process en-



JENKINS FIG. 106-A BRONZE GLOBE 150 LBS. STEAM . . . 300 LBS. O.W.G.

in Disc Equipped Bronze Valves

LOOK at that Wheel — Tough malleable iron. Design unequalled for cool, sure grip.

LOOK at the Index Plate — Has Fig. No. etched in green background. Held by wheel nut which is secured by rolled-over spindle end.

LOOK at that Spindle — Made of high tensile bronze. See how much heavier it is . . . how many more deeply cut threads engage bonnet. And, the crowned head that reduces friction on disc holder. Sure, it costs more to make a spindle this way. But it reduces wear, preserves packing, means easier operation.

LOOK at the Packing Nut and Gland—Note the heavy and deep bronze hex. And, that bronze gland designed to compress packing toward spindle.

LOOK at that Packing Box — Its depth equals 1½ times spindle diameter. More packing space means less repacking. An asbestos, lubricated and graphited packing is used.

LOOK at that Bonnet — One-piece, screw-over design with big hex surfaces is easy to remove. Take an extra look at the bevel joint between bonnet and body, serving as an internal brace against the crushing effect of the bonnet assembly. Millions of Fig. 106-A in use for years prove this unique design licks distortion and springing.

LOOK at the Disc Holder — It's the Slip-on Stay-on type originated by Jenkins. Correct protective depth prevents flaking or cracking of disc.

LOOK at the Disc — Easily renewed without removing valve from line. Made of compositions to suit various services . . . and **made by Jenkins,** the only maker of both valves and discs.

LOOK at that Body — Just compare wall thickness of this high tensile bronze body with any other valve. The factor of safety is many times higher than rating requires. See the curved diaphragm to protect seat from distortion by pipe strain. Note that the raised seat is higher to permit more reseating operations . . . and wider, so it won't cut into disc. Pipe threads are full length and clean cut.

LOOK at this . . . for Throttling

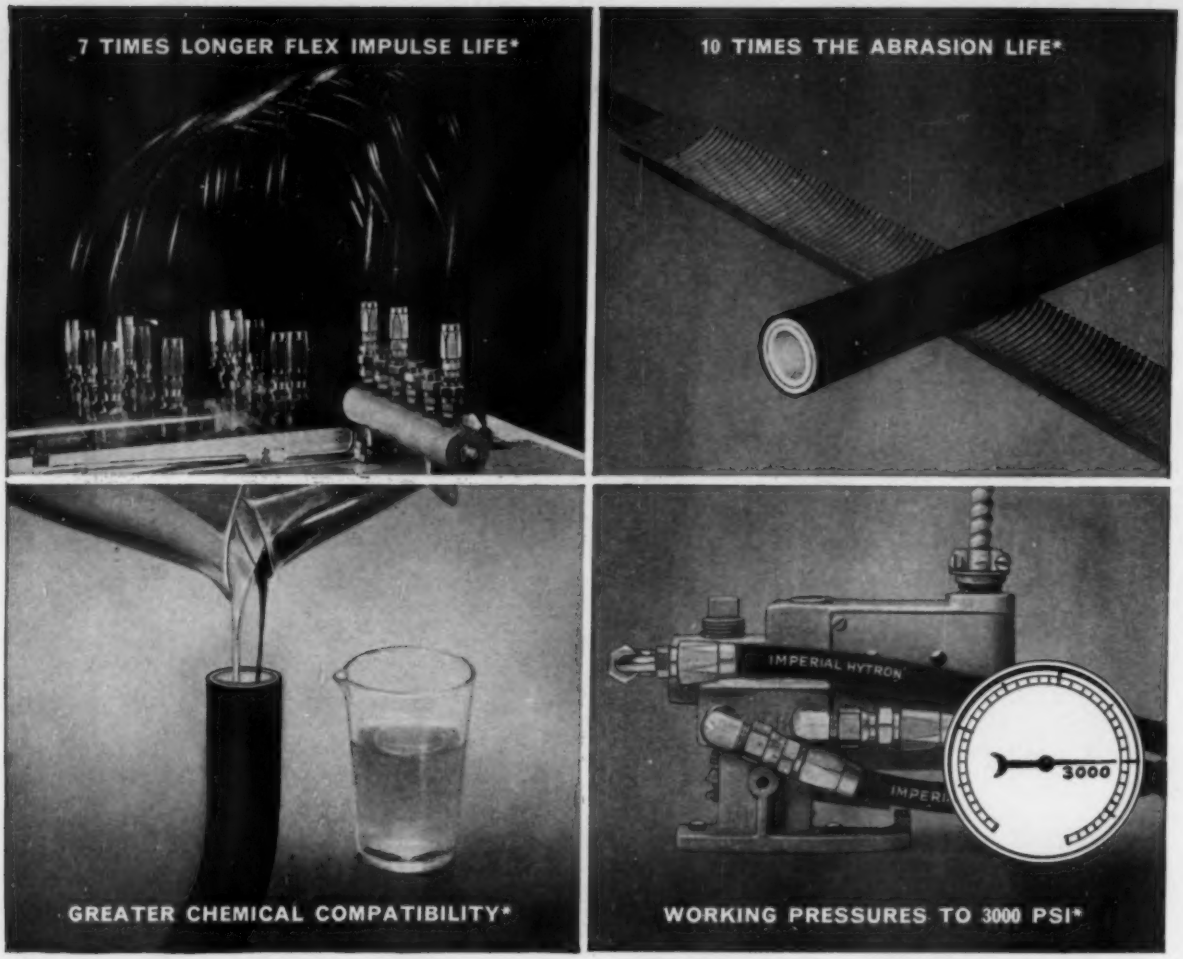
—Just replace the standard disc nut with this Throttling Nut and a Fig. 106-A becomes well-suited to throttling service. This unique nut reduces the effects of wire drawing and its long legs restrict flow for accurate control. Many plants take advantage of this versatile valve to reduce valve and parts inventory.

THE FIRST renewable composition disc valve was a Jenkins Valve, originated nearly a century ago. Compare today's Fig. 106-A Bronze Globe with any other. See why so many valve users agree that a *Jenkins* is still the FIRST for top value. For descriptive folder No. 189-B on the full line of Jenkins Bronze Globe, Angle and Check Valves write to Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS VALVES

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

Circle 608 on postcard, page 33



No wonder HYTRON® HOSE outperforms wire braid hose . . .

Hytron polyamide-polyester hose takes abuses that make other plastic and wire braid hoses fail. It's tough, durable, lightweight. Has 7 times longer flex impulse life than wire braid. It's versatile. Greater compatibility with mineral or synthetic fluids having a water or phosphate ester base gives Hytron a wider range of uses than other hoses. Available in long lengths, too—to 1000 ft. Some of the hundreds of applications especially suited to Hytron hose include:

Hydraulic lines	Non-conductive (electrical) applications
Hot paint lines	High-lines for electric power
Solvent lines	Fuel and oil lines

High pressure pneumatic and CO_2 lines

*Based on comparative tests with one-wire braid hoses.

Find out how Hytron Hose can do the job better and save you money. Send for detailed report and test results—Bulletin NEPR-500.

IMPERIAL EASTMAN

Imperial-Eastman Corporation General Offices: 6300 West Howard Street, Chicago 48, Illinois

Imperial-Eastman Corporation (Canada) Ltd., Barrie, Ontario, Imperial-Eastman, S.A., Apartado Postal 26544, Mexico 13, D.F.

Circle 609 on postcard, page 33

EXTRA-TOUGH
AND FLEXIBLE
1. Abrasion-resistant thermoplastic cover
2. Tough polyester reinforcement—no wires to fatigue
3. Clean, nonporous, seamless polyamide inner tube

it's thermoplastic!

- Highly flexible—minimum bend radius is only half that of one-wire braid hose.
- 60% lighter in weight than wire braid hose.
- Smaller O. D. than same size I. D. wire braid hose—reduces assembly bulk, permits use of more couplings in confined areas.
- More resistant to more chemicals at higher temperatures than standard hose. Resists sunlight, mildew, aging.
- Temperature ranges from −40° to 225° F.
- Low diametrical expansion.
- Over 200 times the torsional fatigue life of wire braid.
- Available in long lengths—up to 1000 ft. Sizes ⅛" to ½".

Hytron hose furnished as factory-made assemblies with permanently attached couplings, or with easy-to-install, re-usable couplings in a wide range of sizes and styles.

IMPERIAL — EASTMAN

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

vironments of high humidity, corrosive atmosphere and wide temperature extremes. During assembly, they're permanently programmed to meet specific needs. (Basic components can be had by those who want to assemble their own computers.) According to manufacturer, PC-12 Computers offer advantages over the conventional units controlling only one parameter of a process from the measurement of one or two variables. Also while capable of performing the same functions as digital computers, these units have higher computing speeds, are easier to program and maintain, and cost less. Electronic Associates, Inc.

For details, circle 24 on Post Card

SAFETY COMPOUND removes heavy sludge deposits

MM-17 is described as a practical application of colloid chemistry. Penetrants in the compound drive solvents through and under sludge. Each particle of sludge is enveloped with a layer of emulsifiers. When water is applied the particles become suspended in the form of an emulsion. This permits flushing clean with either salt or fresh water. The emulsifying action of MM-17 is reported effective on oil spills on land and water as well as on accumulated deposits of sludge on oil storage tanks, pipe lines, other oil handling equipment. Rockland Industries, Inc.

For details, circle 25 on Post Card

SAFETY SWITCH indicates insufficient water flow

This water level safety switch is designed to prevent pump damage due to insufficient liquid at the source, or when pump loses its prime, in installations where bearings, packing glands and motor windings depend on pumped water for lubrication and cooling. The device senses liquid flow by measuring discharge pressure and automatically shuts down system when water level gets too low. Switch mounts on pump discharge line, and is connected, in series, with pump motor power supply. If after a predetermined period, pump discharge is not at specified pressure level, a microswitch disconnects pump motor. At frequent intervals, automatic cycling of pump is initiated until required conditions are satisfied. United States Gauge Div., American Machine & Metals, Inc.

For details, circle 26 on Post Card

INSULATING CEMENT with high temperature range

BEH No. 1 Plus, a mineral wool insulating cement with a temperature range up to 2100 F, replaces an 1800-F cement at no increase in cost. It is also whiter than the former product and easier to handle. Through a reduction in nodule size of the mineral wool, the mixed material, ready for application, is less lumpy. Greater smoothness and uniformity are reported. Dry coverage is 45 sq ft 1 in. thick per 100 lb. Linear shrinkage after heating at 2100 F is 3 per cent. Baldwin-Ehret-Hill, Inc.

For details, circle 27 on Post Card

FLUORESCENT UNITS use circular, stacked luminaires

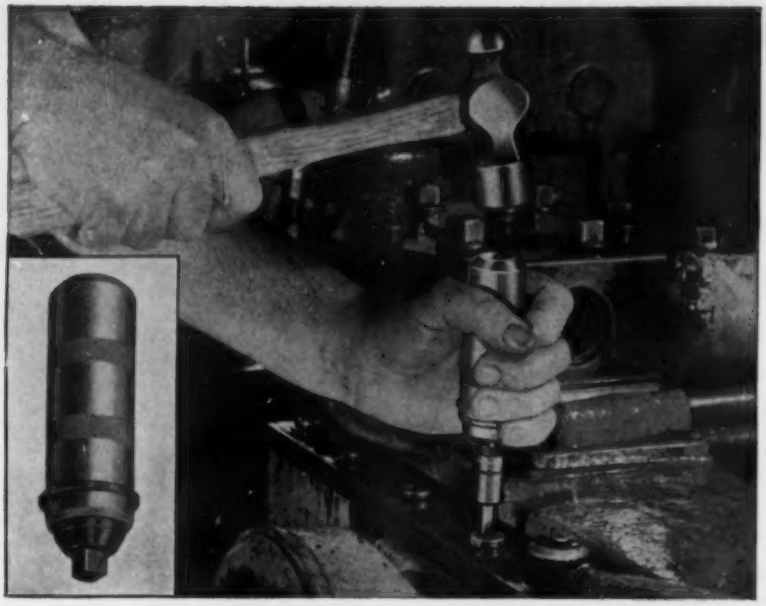
The Trianon features six- and eight-lamp stacked Circa-Lite luminaires suspended from triangular-shaped tapered aluminum poles. Ballasts are

mounted inside the pole at its base, for one-man re-lamping and servicing of entire unit from ground level. The six-lamp model delivers 15,000 lumens from an arrangement of 40-w, 16-in. diam circular lamps; the eight-lamp model delivers 20,000 lumens. Pole heights are 10 to 15 ft. Sterner Industries.

For details, circle 28 on Post Card

PRE-FAB FLOORING withstands heavy traffic load

Nu-Flor, a durable, ready-to-lay prefabricated flooring, can be installed quickly over almost any surface to pro-



Break loose those tough, ornery ones with a Snap-on IMPAK DRIVER

★ Protects bolt or screw heads from shearing off
★ Saves time and effort

This new SNAP-ON Impak Driver is just the tool for breaking loose nuts and screws that are rusted or frozen tight.

It's simple and quick. Position socket or screwdriver bit on the nut or screw, give the Impak Driver handle a short twist to set the working cam and powerful return spring, then strike the tool head sharply with a hammer. This blow releases the spring and gives a tremendous twisting force to the blade or socket.

Extra safety to worker

Because of the sharp blow, there's less chance of screw or bolt head's twisting off when you use an Impak Driver. This not only saves time, but it means greater safety. A man pulling at a bolt can be thrown off balance if it suddenly shears off.

½-in. drive set 315-PIT-B (not shown).

⅜-in. drive set 5022-PIT-B (shown above).

Driver works in both directions — can be used to tighten as well as loosen nuts or screws. Two sizes — 3/8-in. and 1/2-in. square drive. Available with sockets plus standard, Phillips and hex-head drivers. Bolt capacity up to 13/16 in.

Order an Impak Driver set now from your SNAP-ON man. It will pay for itself many times over.

FOR ALL INDUSTRY

SNAP-ON TOOLS

8068-J 28th AVENUE • KENOSHA, WISCONSIN

Circle 610 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

vide a resilient, non-slip surface. Suggested for resurfacing concrete, wood or metal floors, the 2-by-3 ft preformed sections of ¼-in. thickness form a solid new surface claimed not to chip or crack—ideal for trucks. Manufacturer says installation is simple, can be done by inexperienced personnel. The Monroe Co., Inc.

For details, circle 29 on Post Card

OPEN-SIDE HOPPER handles long lengths

This self-dumping hopper with open sides makes possible efficient handling of long, awkward pieces . . . scrap metal, timber and piping. It automatically dumps, by tripping a lock han-

dle on the rear of the hopper, and returns to normal upright position and locks. Units are mounted on skids for easy handling, but may be equipped with casters. Hoppers are 5/16-in. gauge metal, reinforced with angle irons across front and back. Roura Iron Works, Inc.

For details, circle 30 on Post Card

MOBILE CAR SPOTTER has power coupler on both sides

Model 5 TMG-DC Trackmobile, equipped with power couplers on both sides, has increased drawbar pull capacity to 18,000 lb over 13,000 lb of

standard one-coupler, by borrowing added weight and traction from the double load. The operator has clear vision in negotiating curves and can

Tropical Roof Coolerant tops a terminal

The Port of Richmond, Virginia, welcomes foreign ships with one of the best maintained terminals in the country. Maximum protection of cargoes is ensured—the roof is coated with weatherproof Tropical Aluminum Coolerant, made with Alcoa® Pigments by Tropical Paint Co., Cleveland, Ohio. You can see the clean, uniform appearance.

There are other benefits when you use aluminum coatings. Maintenance costs are reduced. The bright aluminum flakes in coatings like Tropical Coolerant form a metallic shield that prevents the underlying oils from drying out. This means the coating will stay pliant and moistureproof in all seasons—won't run or sag in summer or crack in winter. This also means a tight, continuous surface that will add years to the life of the roof. Interiors are cooler during the hot summer months because the reflective aluminum flakes turn back much of the sun's radiant heat.

Aluminum coatings like Tropical Coolerant are preferred protection today on hundreds of public and industrial buildings. Applied with ordinary roofing brush or heavy-duty spray equipment, one coat seals any surface—metal, masonry or composition.

Alcoa does not make aluminum roof coatings, but we will be happy to refer you to reputable manufacturers who do. For more information about aluminum paints and roof coatings, please send the coupon.

Entertainment at Its Best . . . ALCOA PREMIERE with Fred Astaire as Host . . . Tuesday Evenings, ABC-TV

ALCOA ALUMINUM

PIGMENTS, PASTES & POWDERS

Aluminum Company of America
1751-K Alcoa Building, Pittsburgh 19, Pa.
Please send your free booklets:

☐ *Painting With Aluminum*
☐ *Aluminum Roof Coatings Make Time Stand Still*

Name_____

Company_____

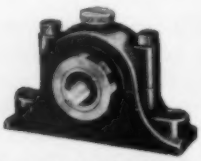
Address_____

City_____ Zone____ State_____

Circle 611 on postcard, page 33

NEW! DYNA-V DRIVES
Save space, weight and cost!

TAPER-LOCK ROLLER CHAIN DRIVES
No reboring — no waiting!



DODGE PILLOW BLOCKS with TIMKEN BEARINGS
America's Quality Pillow Blocks!

Write for Bulletins!

- ✓ Dyna-V Drives—selection data.
- ✓ Chain and Sprockets—drive data.
- ✓ Rolling Bearings—ratings, data.

DODGE MANUFACTURING CORPORATION
2700 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

PLANT ENGINEERING EQUIPMENT

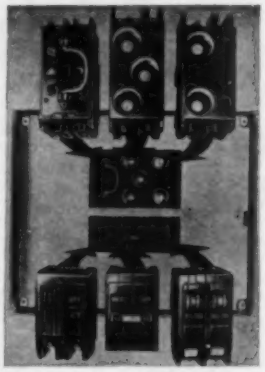
(Begins on page 190)

position cab to ride inside or outside of track curve. Available with gasoline or diesel power. Whiting Corp.

For details, circle 31 on Post Card

SERVICE ENTRANCE LINE accepts breakers, fuses

The 4-In-1 Breaker Fuse line makes it possible to install both circuit breakers and plug-in fuse blocks in the same panel. Each panel has dual mounting

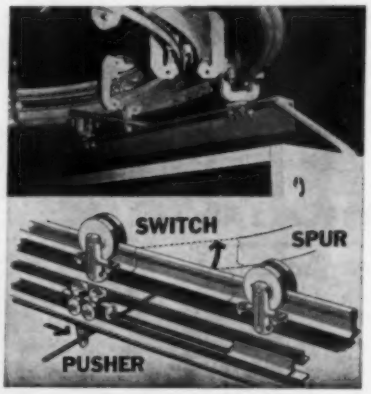


provision, for flush or surface installation. The 4-In-1 design allows flexibility in choice of plug-in components—you can install, in a single panel, two-pole breakers for 240-v appliances and lower cost plug fuses for lights and outlets. Selection is easier—only 29 panels cover requirements from 100 to 200 amp; 12 to 40 circuits; flush, surface or raintight; circuit breaker or fusible. General Electric Co.

For details, circle 32 on Post Card

PUSHER CONVEYOR SYSTEM with spur tracks

This "chainless" overhead conveyor system, pushing 1000-lb capacity trolleys on a parallelling heavy-duty Mono-



Rail track, combines advantages of continuous and semi-continuous operation. Spur tracks with manual switches may be located at any point on the outer track so carriers can circulate continuously or be switched into spur track stations. Spur tracks can be extended to other areas. Construction of the trolleys permits pushing heavy loads without canting on curves, dips, or rises, manufacturer states, and no corner sprockets, traction wheels or roller corners are required. An in-line drive transmits power through a roller chain. Trolley capacities range to 4000 lb. The American MonoRail Co.

For details, circle 33 on Post Card

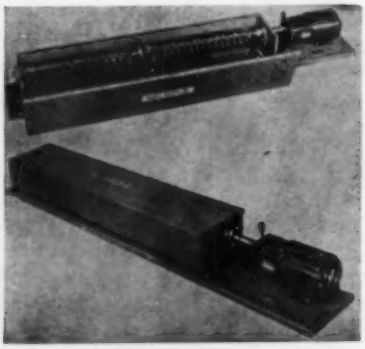
HYDRAULIC FLUID is fire-resistant, controls corrosion

Fyre-Safe 225 is a water-glycol type fluid designed to provide practical nonflammability and improved corrosion control in hydraulic operating systems, as well as excellent heat transfer and high conductivity. While high in water content (35 to 50 per cent), it also has a high viscosity index combined with low pour point to minimize cavitation during cold weather start-up. Nalco Chemical Co.

For details, circle 34 on Post Card

ADJUSTABLE PROGRAMMER controls 30 circuits

This sequencing programmer, with its own adjustable speed drive motor, is designed for use where sequencing of motions is desired. Typical appplications include sequencing of assem-



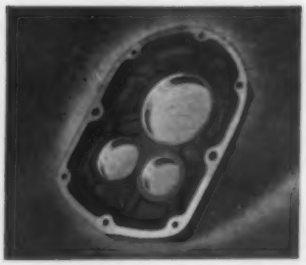
bly machines, testing apparatus, etc. Individual adjustment of circuits from 352 to 8 deg of a revolution is possible with the use of micro-adjust split lobe cams. The adjustable speed drive motor facilitates variations from 150 to 0 rpm while the cams are in motion. The dial is adjustable before mounting and provides a reference if changes are desired. Single-pole, double-throw, snap-action switches are used. The switches are rated at

...the quality-engineered package

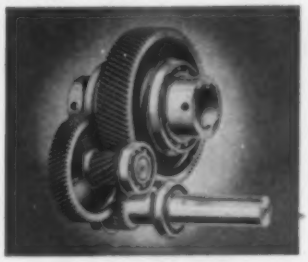
that simplifies speed reduction

DODGE TORQUE-ARM, America's most widely used shaft mounted speed reducer, will save money for *you.* No foundation, no sliding motor base, no flexible coupling, no installation fuss. Developed and perfected by Dodge, this reducer has been so widely accepted in industry that it is now built and stocked in this unmatched range of sizes and models: capacities up to 170 hp; output speeds from 10 to 400 rpm; ratios of 5:1, 15:1, 25:1; speed ratios up to 175 to 1 with correct selection of speed reducer and V-belt drive. Built-in backstop available. Also positive overload release. Vertical models. Flange mounted models. Special application models . . . Go modern—go Torque-Arm! See your Dodge Distributor, or write us.

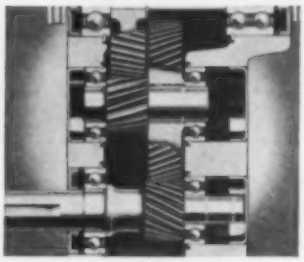
Dodge Manufacturing Corporation, 2700 Union St., Mishawaka, Ind.



Rugged, semisteel housing holds bearing seats in line for entire life of unit. Laughs at loads. Corrosion resistant.



AGMA rated helical gears. Soft cores withstand shock; hardened surfaces defy wear. Teeth are crown shaved.



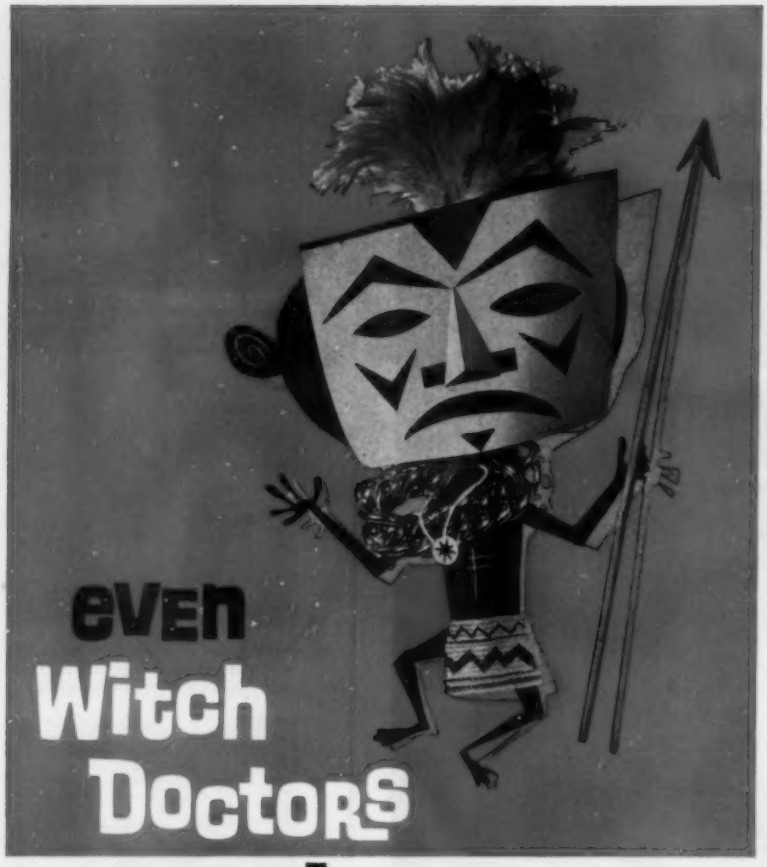
Gears are located *between* bearings and carry their loads without strain. Longer life, higher efficiency.

Unit slides completely onto shaft and locks on *both* sides of housing. This baby stays *put*—runs truer longer.

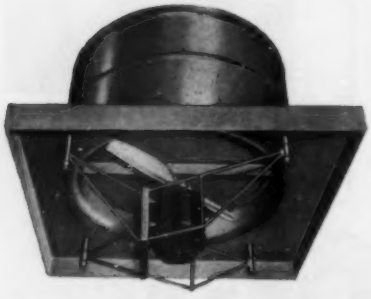
The Products with the Pluses... **DODGE** *of Mishawaka, Ind.*

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Look under "Dodge Transmissioneer" in the *white* pages of your phone book. Factory trained by Dodge, he can give you valuable assistance.

Circle 612 on postcard, page 33



prescribe
HARTZELL ROOF VENTILATORS
for efficient, economical
exhaust of heat, smoke and fumes



You will find Hartzell Roof Ventilators wherever industry has need for a high efficiency ventilator which will operate year after year with a minimum of maintenance. Vertical discharge types such as the Hartzell Vertijet (shown at left) are simple, fool-proof, easy to install and economical to operate. Other types are also available, including a unique reversible ventilator which can be used for exhaust or intake at the flip of a switch.

For complete details, just give your nearby Hartzell Field engineer a call. You'll find him listed in the Yellow Pages or in the Hartzell catalog in Sweet's Plant Engineering and Industrial Construction Files.

Hartzell PROPELLER FAN COMPANY
Division of Castle Hills Corp. • PIQUA, OHIO
(HARTZELL)
A Member of AMCA

Circle 613 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

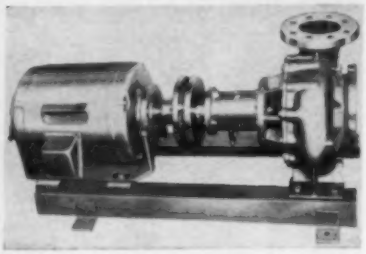
(Begins on page 190)

5 amp, 400 v a-c; 10 amp, 220 v, and 15 amp, 115 v a-c. Built-in clutch brakes with reset mechanisms from 2 to 30 circuit size are included. The programmer comes in five NEMA enclosure types. Included are built-in clutch brake combinations with reset mechanisms. Gemco Electric Co.

For details, circle 35 on Post Card

CENTRIFUGAL PUMP features forced feed lubrication

The B9 Centrifugal Pump features sleeve bearing forced feed lubrication for long bearing life and a "self aligning" coupling that connects sleeve bearing motor to pump. Fabricated



iron base provides quieter operation and easy cleaning access to pump. Includes 1750-rpm sleeve bearing motor. Capacity ranges to 1000 gpm, heads to 80 ft. There are 11 models from 1 through 10 hp. Form 1445 gives more information. Dunham-Bush, Inc.

For details, circle 36 on Post Card

TRANSDUCER, dual-purpose, works without direct contact

Philips Type PR-9262, an electromagnetic transducer, can detect or excite vibration without contacting the object to be tested. The pick-up may be used where the object to be measured is so small that any contact with an indicating instrument would influence vibration. It also permits investigation of pulsating phenomena. A feature is absence of contact resonance. The object to be vibrated or measured need not be magnetically conductive. Affixing a thin disc of silicon steel to the object makes it effective for study.

This lightweight transducer measures both relative and absolute vibrations, transforming them into electrical voltages whose magnitude is proportional activity to velocity. By using the proper integration network, the pick-up will also read amplitude and acceleration of vibration. Reversible properties

USE THESE IDEAS...

TO GET UP TO AN EXTRA 4% NET PROFIT

Out of the Texaco man's briefcase comes a wealth of ideas for cost control through organized lubrication—Texaco's "Stop Loss" Program. Managers in many industries are already using these plans to reduce losses in three important areas: production, maintenance and purchasing. Their savings go directly into profits—the average is a 4% gain in their net. Get the facts. Write for our informative folder: "How to Starve a Scrap Pile." **TEXACO** INC., 135 East 42nd Street, New York 17, N. Y. Dept. E-191

TEXACO

THIS IS THE SIGN OF A·D·T

...and it spells *security* for more than 55 billion dollars' worth of commercial and industrial properties from coast to coast.

First in its field for more than 87 years, ADT offers the widest range of electric protection services to meet the toughest security requirements.

Combinations of these automatic services can give you a greater degree of plant security than outdated and less dependable methods — often at *less cost!*

Today, more than 70,000 service subscribers (including almost all of the largest corporations in the nation) rely on ADT to safeguard life, property and profits against fire, burglary and other hazards.

An ADT security specialist can show you what dependable protection really means. Call him today—he's listed in your telephone book—or write our executive office for an illustrated folder (Canada and U.S. only).

AMERICAN DISTRICT TELEGRAPH COMPANY
Executive Office: 155 Sixth Avenue, New York 13, N. Y.
A NATIONWIDE ORGANIZATION

ADT

Circle 615 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

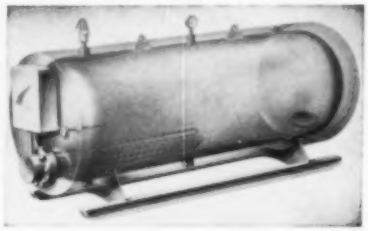
(Begins on page 190)

of energy conversion in this transducer also enables it to excite vibrations. The PR-9262 is suited for cryogenic as well as high temperature applications. The unit, produced in Netherlands, is 2 in. long, weighs 1 oz. and sells for around $150.00. The Korfund Co., Inc.

For details, circle 37 on Post Card

ELECTRIC WATER HEATER is completely packaged unit

The compact, completely-automatic P-KW Storage Water Heater is available for vertical or horizontal operation. Storage capacities range to 1300

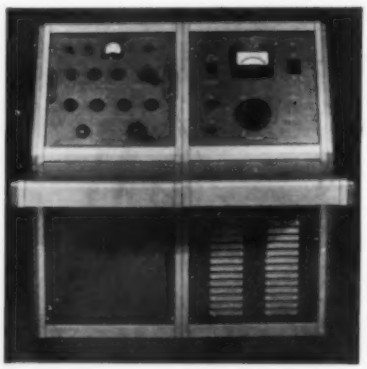


gal., with recovery capacities to 410 gph, working pressure to 150 psi, and immersion elements for up to 240 v. Units are completely insulated, factory wired, ready for service connections. Shell materials are plain steel, copper silicon, copper-lined, and Pre-Krete, a pre-blended cement. The Patterson-Kelley Co., Inc.

For details, circle 38 on Post Card

CAPACITANCE BRIDGE has built-in performance check

This high voltage capacitance bridge, featuring direct reading and built-in performance check, is available in mobile or stationary consoles to 500 kv, or higher voltage if desired. It is announced as featuring accuracy of measurement of 0.2 percent and dis-



YARWAY news briefs

from **Yarnall-Waring Company,** *Philadelphia 18, Pa.*

BRANCH OFFICES IN 19 UNITED STATES CITIES • SALES REPRESENTATIVES THROUGHOUT THE WORLD
STEAM TRAPS STOCKED AND SOLD BY 270 LOCAL INDUSTRIAL DISTRIBUTORS

DON'T WAIT TILL SNOW FLIES TO PROTECT OUTDOOR STEAM LINES FROM FREEZE-UPS

INSTALL NON-FREEZING YARWAY IMPULSE STEAM TRAPS NOW

Remember last winter?

Will you ever forget those lost production hours and the costly maintenance time resulting from frozen steam lines? Why let it happen again?

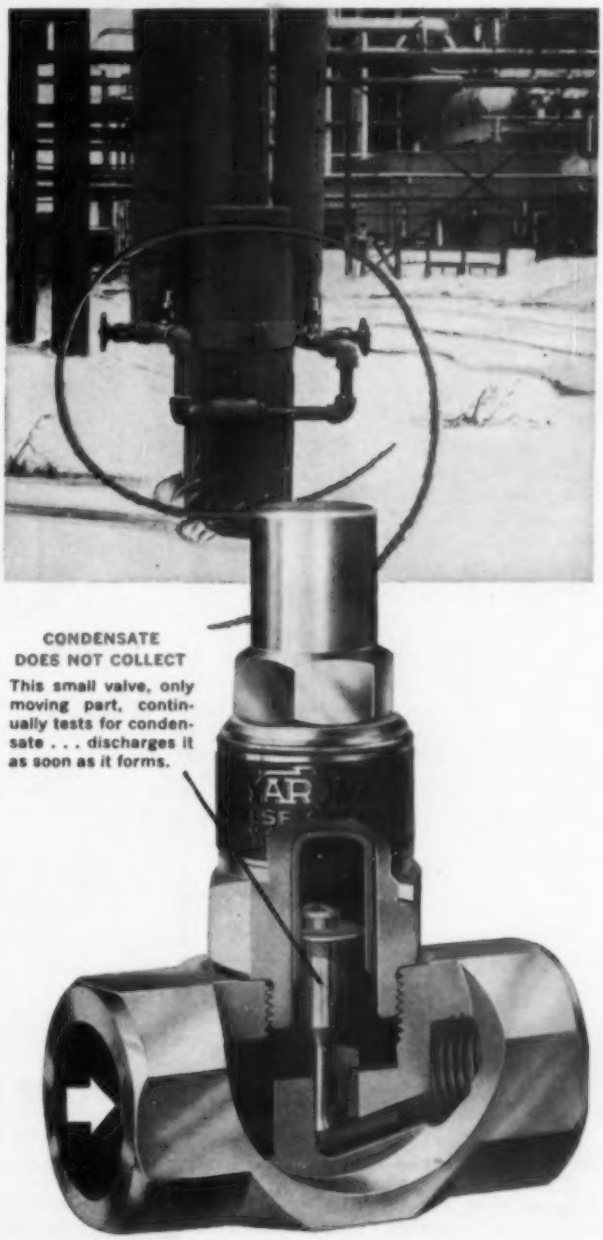
Steam lines and exposed process equipment that you equip *now* with Yarway Impulse Steam Traps—will be free from freeze-ups and ready for peak production later, when temperatures plummet and the "big freeze" sets in.

In the Yarway Impulse Trap there's nothing to freeze. No condensate collects. The only moving part (a small piston-like valve) continually tests for condensate and discharges it as soon as it forms. Result—continual operation of equipment at high, even temperatures.

Consider, also, these other Yarway Impulse features:

- QUICK HEAT-UP
- LOW MAINTENANCE
- STAINLESS STEEL CONSTRUCTION
- SMALL SIZE—LIGHT WEIGHT
- GOOD FOR ALL PRESSURES
- COMPLETE LINE FOR WIDE APPLICATION COVERAGE

Check *your* trapping needs *now*. Yarway traps are stocked and sold by 270 local Industrial Distributors. Write for Bulletin T-1743.



CONDENSATE DOES NOT COLLECT

This small valve, only moving part, continually tests for condensate . . . discharges it as soon as it forms.

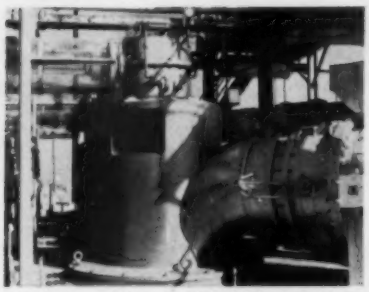
YARWAY OFFERS IMPULSE STEAM TRAPS FOR THESE SPECIFIC OPERATING CONDITIONS

AVERAGE CONDENSATE LOADS	EXTRA HEAVY CONDENSATE LOADS	LIGHT TO MODERATE CONDENSATE LOADS	
Series 60 and 120	Series 40	Series 30	Series 130

Circle 616 on postcard, page 33

● Why a Johnston Mixed-Flow Vertical Pump has such a wide range of application

The Johnston Mixed-Flow pump has been called the pump that fills the "vital gap" because it fits so well applications requiring both medium lifts and medium to high capacities. A mixed-flow, for example, will lift liquids in the range of 20 feet to 60 feet with capacities from 500 gpm. to 150,000 gpm.



28,000 gpm. Johnston's Mixed-Flows used for effluent pumping in Costa Mesa, Calif., plant of Orange County Sanitation District

Design Characteristics Are Responsible

The reason for the performance capabilities of the mixed-flow pump lies in its design. In the vertical turbine, the liquid being pumped flows with a strong centrifugal action. In the propeller pump there is no centrifugal action but an axial flow. However, the mixed-flow pump incorporates the advantages of both—the centrifugal action which imparts greater lift and axial flow movement which allows greater capacities to be pumped. (See Fig. 1).

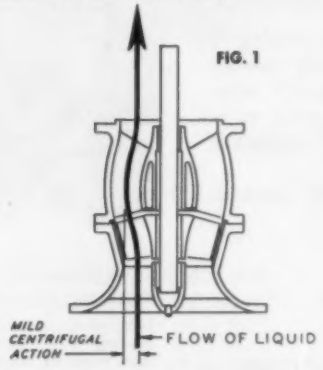
The pumping element in the mixed-flow is an impeller, usually 5 or 6 vanes of the semi-open type, with a large suction eye incorporating low NPSH requirements. The bowl assembly is vaned in order to guide the radial flow which gives the pump its medium lift characteristics. The impeller is adjustable in the same manner as a semi-open impeller in the normal turbine bowl assembly.

Other Mixed-Flow Advantages

In addition to its other characteristics, the mixed-flow has the further advantages inherent in all vertical turbine pumps; high efficiency, easy surface adjustment of impellers, quick accessibility (the entire column and bowl assembly can be lifted out) and small surface space.

Typical Mixed-Flow Applications

The applications for which mixed-flow pumps have proven most useful include use in cooling tower circulation, biofiltration and effluent pumping, industrial waste waters, storm and drainage stations, irrigation projects and municipal aqueduct or canal pumping.



Johnston has been making vertical pumps to the most exacting standards for over half a century. If you would like information on a specific application or details on the use of a Johnston in your business, please write or call the main plant or the factory branch nearest you. Trained field men are available to help solve your problem.

JOHNSTON PUMP COMPANY

Main Factory: Pasadena, Calif., 3272 E. Foothill Blvd.; Phone: MU 1-7601

Branches: New York, N.Y., 30 Rockefeller Plaza; Phone: PL 7-0431 • **Atlanta, Georgia,** 57 Forsyth St., N.W.; Phone: JA 3-7395 • **San Francisco, Calif.,** 260 Kearny St.; Phone: EX 2-0338 • **Roswell, N.M.,** 2007 S.E. Main; Phone: MA 2-5942 • **Pecos, Texas,** Balmorhea Highway; Phone: HI 5-3022 • **Idaho Falls, Idaho,** North Yellowstone; Phone: JA 2-8144

Circle 617 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

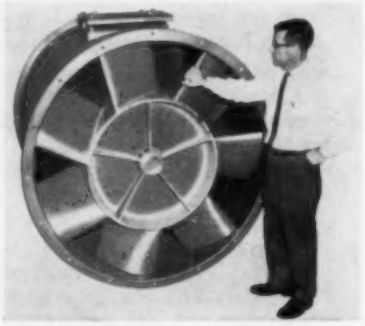
sipation factor measurement of 0.01 percent. The unit is designed to measure capacitance, dielectric losses and dissipation factor of insulation and insulated apparatus such as bushings, power cable, transformers etc. while insulation is stressed at operating voltage. Manufacturer says both capacitance and dissipation factor can be read directly without calculation. Automatic guard circuits included. General Electric Co.

For details, circle 39 on Post Card

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 33-34.

VANEAXIAL BLOWER available in 60-in. size

This 60-in. diam belt-driven vaneaxial blower will move 96,450 cfm at 2 in. static pressure or 66,500 cfm at 7-in.

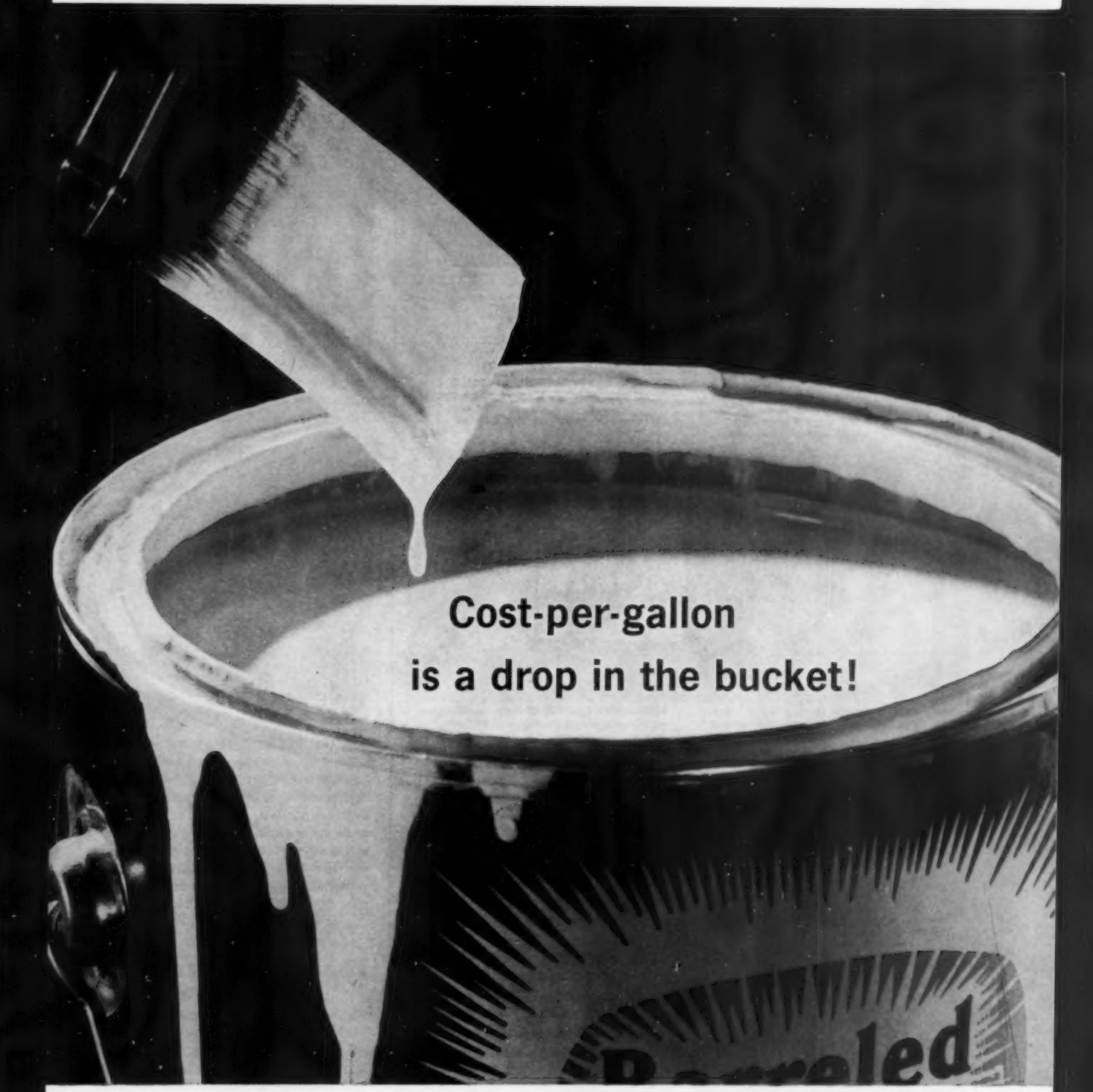


static pressure. It has cast aluminum-alloy impellers and all-welded construction. Hartzell Propeller Fan Co.

For details, circle 40 on Post Card

GAS DETECTOR guards against explosive fumes

Model 530 Gas-O-Larm Detector tells the percentage below explosive concentration of inflammable gas present in the air. Operation is on dry cell batteries actuated by an electrically-operated probe containing a detector element. The detector is factory calibrated for methane and ethane gases, but may be calibrated for other gases. The calibration curves show the actual gas percentage for specified gases. The instrument panel controls the operation and contains spare detector ele-



(The **big** savings in **Barreled Sunlight Paints** are in their lower "on-the-wall" costs.)

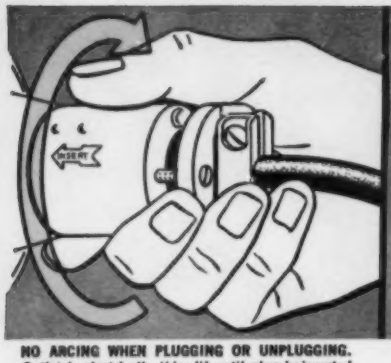
What you pay for paint "in the can" is a small part of your total tab for paint maintenance. It's what you pay for the applied cost per square yard—the "on-the-wall" cost—that really adds up to a debit or credit on your paint purchase order. ✓ ✓ This is why an increasing number of plant engineers and maintenance men are asking for Barreled Sunlight Engineered Paints by name. Their experience has proved that Barreled Sunlight Paints not only cost less to apply (because they go on faster, easier, with fewer costs) but actually last longer under tough conditions. ✓ ✓ Before you buy *any* paint—at any price!—have a Barreled Sunlight Engineered Paint representative prove the economy of quality with an actual "On-The-Wall" Demonstration in your plant. No charge . . . no obligation. Write Barreled Sunlight Paint Company, 125-J Georgia Avenue, Providence 5, Rhode Island

2 FREE GUIDES
The famed Barreled Sunlight **"Quick Reference Guide"** to more than 50 Engineered Paints, Primers and Undercoats plus a 10-page booklet on **"How To Reduce Painting Costs."** Write for them.

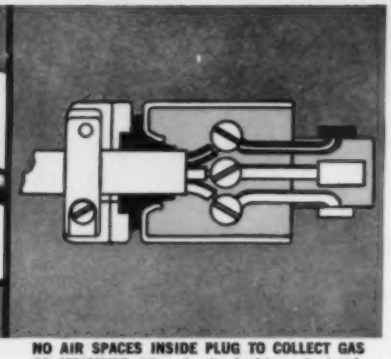
Barreled Sunlight
ENGINEERED Paints

For a Better Looking, Longer Lasting Paint Job at Lower Cost

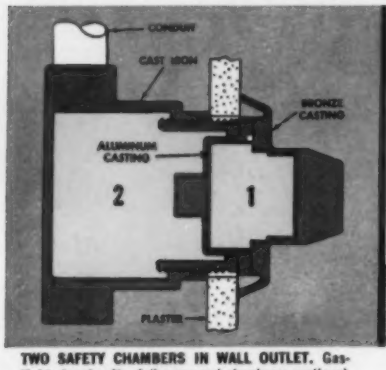
Circle 618 on postcard, page 33



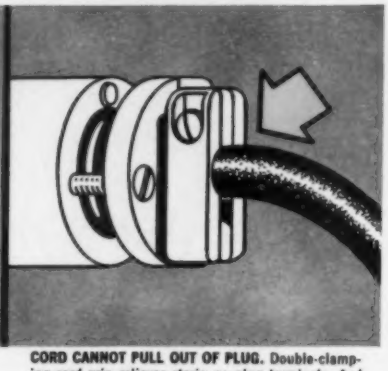
NO ARCING WHEN PLUGGING OR UNPLUGGING. Outlet is electrically "dead" until plug is inserted and rotated 22-25°. Reverse turn disconnects current before plug is removed. Spring pressure and keyed construction prevent accidental disconnection.



NO AIR SPACES INSIDE PLUG TO COLLECT GAS OR MOISTURE. After plug is wired to cord, electrician pours a self-hardening insulating resin into all air spaces. Interior of plug becomes solid, water-tight, vapor-tight mass.



TWO SAFETY CHAMBERS IN WALL OUTLET. Gas-tight chamber No. 1 (bronze and aluminum castings) contains and seals off switching mechanism. Cast iron chamber No. 2 keeps minor internal explosions from spreading to room.



CORD CANNOT PULL OUT OF PLUG. Double-clamping cord-grip relieves strain on plug terminals. And because terminals and wires are completely embedded in insulating resin, connections cannot loosen to cause arcing.

NEW

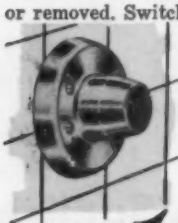
EXPLOSION-PROOF

RECEPTACLE AND PLUG

FOR CLASS I, GROUP C OR D, ATMOSPHERES

The Hubbellock Explosion-Proof Receptacle and Plug prevent arcing when electrical connections are made or broken in explosive atmospheres. No special wiring is required for installation in new or existing structures.

There are no air spaces in the plug where explosive gases can collect. No current can flow to the receptacle contacts while the plug is being inserted or removed. Switching takes place inside a vapor-sealed safety chamber of heavy bronze and aluminum castings.



Any 20-ampere, 125-volt, 60 cycle A.C. appliance may be operated from the receptacle by substituting the Hubbellock Explosion-Proof plug for the present plug. Appliances equipped with the Explosion-Proof plug will also operate in conventional 3-wire Hubbellock receptacles.

Plug and receptacle are listed by Underwriters' Laboratories and are described by the National Fire Protection Association for use in Class I, Group C or D, explosive atmospheres. They are ideal for hazardous industrial areas and for hospital operating and delivery rooms.

Write now for detailed specifications and prices.

"Hubbellock" is a registered trademark of Harvey Hubbell, Inc.

EXPLOSION PROOF *Hubbellock*® WIRING DEVICES

HARVEY HUBBELL, INCORPORATED • BRIDGEPORT 2, CONNECTICUT

Circle 619 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

ments, should probe become inoperative. Beard Instruments, Inc.

For details, circle 41 on Post Card

ELECTRIC HOIST features compact design

Model W-1 Speedway Electric Hoist is available in capacities to 3 tons, with single, two-speed, or variable speed

controls, lug or base mounting, with plain, geared or motorized trolleys and two- to four-part reeving. For close headroom applications it comes in 1- to 2-ton capacities. It can be equipped with company's overload cut-off for three-way protection of operator, load and the hoist itself. Motors are fully enclosed and rated on a basis of 30-min duty cycle. Wright Hoist Div.

For details, circle 42 on Post Card

ROOF VENTILATOR with easy-access top

Entire motor and fan housing of the Flip-Top Power-Flow Roof Ventilator tilts back 90 deg to make motor, drive and fan easily accessible at a convenient working height above roof level.

ONE OF A SERIES OF CHATS ABOUT THE CONSERVATION AND CONTROL OF HEAT

SARCO TOPICS

STEAM CONSUMPTION WAS ERRATIC AT THE SHERATON-ATLANTIC

This is a documented steam story, and if you have the *least* interest in reduction of steam costs you'll read on. The events took place in the laundry and dry cleaning department of the Sheraton-Atlantic Hotel in New York, which purchases district steam; but they could have happened in *any* steam using establishment — including your plant.

This documentary is concerned with money — (their steam bills for laundry and dry-cleaning were tremendous) and how the Sheraton cut the bill $8500 in one year. That's giving away the climax, but not the plot. To begin with, the Sheraton engineering department kept a daily log which revealed excessive steam costs and startling discrepancies. For example, on one day, 44,000 lbs. of district steam were metered and 20,300 pieces finished. On another day, 38,000 lbs. of steam were metered and 23,300 pieces finished. Clue: This ratio was obviously cockeyed!

To relieve your suspense, we can tell you that the Sheraton removed competitive bucket traps and installed around fifty Sarco Thermo-Dynamic Steam Traps, Type TD-50, on the discharge side of each piece of steam heated equipment, and on drips on supply mains between meters and equipment, as recommended by Sarco. The results were dramatic. (Strong men didn't weep, but they did clap their hands a bit.) In the pre-Sarco December, 868,000 lbs. of steam were purchased for $1725. In the post-Sarco December, only 532,000 lbs. of steam were purchased, for $1025. And the volume of work had increased!

There are no crystal gazers on the Sarco staff; lots of competent engineers, though. These steam detectives find inefficient steam trapping at the bottom of countless high cost mysteries. Sad part of it is, the high cost of steam is only part of the story. Inefficiency in trapping can create other costly problems, too.

We talk a lot about our Thermo-Dynamic trap, don't we? So do other people. In fact we're quite used to grateful cheers of appreciation. Why don't you get the full story, by asking for it? Phone, telegraph, mail—choose your favorite medium of communication.

SARCOTROL! OUR WORD FOR SOMETHING SPECIAL IN TEMPERATURE CONTROL

It may be just what you've been looking for. We don't know. It's rather unusual. We know what it can *do*, but we still don't know everyone who needs it, even though we've been selling Sarcotrol successfully for many years to the plastic fabricating industry. New people we never heard of keep popping up saying it's just what they've needed.

When we designed Sarcotrol we planned it for specific use as a heating and cooling unit for injection molds, cylinders, rolls and drums. What surprises us is that so many different kinds of other equipment are evidently now in search of just such a control, from Banbury mixers to electric coffee pot testers.

The Sarcotrol is a portable, automatic temperature control system utilizing closed recirculation of the heat transfer fluid, to insure even temperatures throughout the equipment being heated and/or cooled. Here's the operating principle. Btu's are supplied to or removed from the rapidly moving high-pressure, high temperature fluid; the variations between delivery and return temperatures being held to a very narrow segment of the Sarcotrol's wide temperature adjustment range. A broad range of flow rates is available to handle widely varying heating and cooling loads, while maintaining tight control of temperatures across the equipment. The basic control mechanism is our own electric indicating controller. Four

standard, fully adjustable, working temperature ranges, cover all heating or cooling requirements between 0° and 300°F. (Keep reading . . . you can always go back for details.) On start-up, full heater capacity is available, and when circulating water approaches control point, heat input is automatically reduced for closer control. Temperature control instruments are automatically compensated for ambient temperature variations.

Heard enough? If not, you must feel a responsive chord vibrating, so write for details. There's literature available which contains much more information than we can give you in this chat.

OUR NEW PUBLICATION IS PRACTICAL—PLUS

SARCOSCOPE is our new house magazine into which we pour what we hope will be a useful mixture of ideas, case histories, tips, facts, news, and sense — both common and uncommon. If you are not receiving

it, we'll be happy to send future issues to you. Just send your name and address. Sarco publishes it as a service to people interested in the conservation and control of heat. We try to keep it down-to-earth, practical and useful.

SO YOU THINK YOUR PROBLEM'S UNIQUE?

Lots of hot water and steam is being wasted these days, in lots of ways. If your eyes glaze as you watch your steam bills mount or shut down your equipment for maintenance, you probably wonder what you did to deserve such problems. If it's any consolation, it's very unlikely that you are alone in your misery. The chances are excellent we have solved just such a problem already for plants similar to yours. Try us. Describe your problem in a letter. We'll probably be able to send you a set of Sarco Case Histories, describing how other plants were able to conquer problems like yours.

5897

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

Sheraton Case History
Circle 620 on postcard, page 33

Sarcotrol
Circle 621 on postcard, page 33

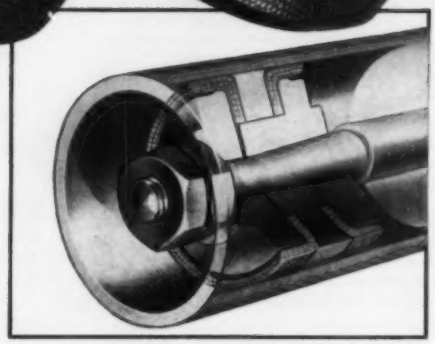
Sarcoscope Magazine
Circle 622 on postcard, page 33

PUMCUP ADVANTAGES

now yours for

- **HYDRAULIC CONTROLS**
- **AIR CYLINDERS**
- **RECIPROCATING PUMPS**

Two common Pumcup types: conventional and 45° bevel type . . available in a complete range of sizes and texture-engineered compositions.



Cutaway view of typical Pumcup installation resulting in prolonged high efficiency.

TAKE it from experienced users, Darcova Pumcups offer payoff advantages that can't be equalled! For example, they last many times as long as ordinary piston packing..and they *hold peak efficiency* from start to finish. Because of the resulting production and maintenance economies, plant after plant is standardizing on Pumcups.

Improved application of the cup principle does the trick. And Darcova Pumcups are *texture-engineered* in *a range of compositions* to meet most temperature-pressure-fluid conditions. And they are available in sizes and types exactly right for your particular equipment.

It will pay you to get *all* the facts. Just ask for Pumcup Bulletin No. 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

Circle 623 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

Available with fan wheels to 48 in., capacities to 43,070 cfm. Bulletin DR-7-61 gives specifications. DeBothezat Fans Div.

For details, circle 43 on Post Card

PLASTIC PACKING for use in trickling filters

Dowpac 20A consists of individual plastic sheets, corrugated in two directions, for treatment of water-borne wastes in trickling filter applications.

Self-spacing design permits sheets to be assembled side by side to form a cubic module for erecting an aerating tower. Configuration of sheets is designed to distribute liquid wastes on thin films over large areas so maximum aeration is obtained; to provide high percentage of void space for natural draft ventilation and waste flow and large surface areas to which active biological slimes can adhere.

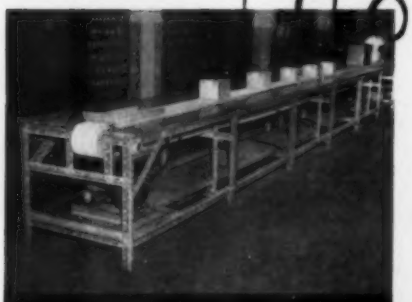
In operation, a tower erected with Dowpac modules encourages and sustains aerobic biological oxidation and stabilization of wastes, and simulates self-purification process of natural waters. Sheets of Dowpac, fabricated from a stabilized Saran, are lightweight yet self-supporting conventional vitrified tile underdrains and structural containment walls aren't required. Dow Chemical Co.

For details, circle 44 on Post Card

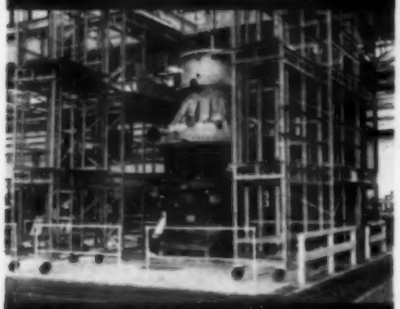
GATE VALVES of bronze, solder-end design

These 150-lb WSP, 300-lb WOG, bronze solder-end gate valves, designed for use with types K, L and M copper tubing, are available in rising and non-rising stem design in sizes from ¼ through 2 in. They feature Alloy 40 stem, molded one-piece impregnated packing and full-length wedge guides. Extra heavy wall thicknesses are said

HOW TO TIGHTEN UP ON FRAMING COSTS



Customizes at lowest cost



Simplifies complicated jobs

Also in "ready-to-assemble" kits

Acme Steel's AIM Brand Slotted Angle frames anything faster, easier, stronger . . . at less cost

Bring on any framing job—platforms, ladders, steps, work tables, benches, stands, conveyors, storage racks . . . even complete staging areas. Acme Steel Slotted Angle will tackle them all . . . complete them all with amazing speed, ease and material savings.

Simplicity is the secret. This rugged, galvanized steel do-all material is simply sheared to size with an AIM Brand Cutter and bolted together. The cutter and a wrench are the only tools needed. No drilling, sawing or welding. And Acme Steel's exclusive pattern of precision slots and holes aligns perfectly with opposite members. There's no figuring and finagling to fit pieces. Your men can master assembly in minutes. Obviously, manpower savings are tremendous.

AIM Brand's superior bolting pattern also gives you virtually unlimited design freedom, plus unparalleled structural rigidity.

All factors considered—initial cost, assembly savings, design versatility and 100% reusability potential—you'll come out way ahead with Acme Steel Slotted Angle.

NOW IN CONVENIENT "PRE-CUT" KITS. New AIM Brand Slotted Angle Kits offer over 250 types and sizes of storage units, die, sheet and bar stock racks, desks, tables, benches and carts. Nuts, bolts, accessories, instructions included. Send for facts.

ACME STEEL IDEA LEADER IN FRAMING

ACME STEEL COMPANY, Fabricated Materials Division, Dept. PES-101, 135th St. & Perry Ave., Chicago 27, Ill.

- ☐ Send new idea booklet on slotted angle.
- ☐ Send facts on new slotted angle kits.
- ☐ Send name of my nearest AIM Brand distributor.

Name _____

Title _____

Firm _____

Address _____

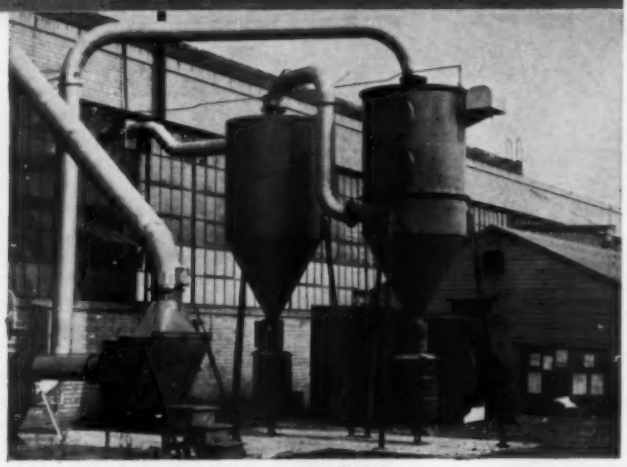
City _____ *Zone* _____ *State* _____

Circle 624 on postcard, page 33

CONTROLLING BERYLLIUM DUST

. . . Another Tough Task Made Easier and Safer by

SPENCER VACUUM



The Bendix Corporation, Eclipse-Pioneer Division

Toxic nature of its dust makes beryllium a "problem" metal to machine. But not here!
Spencer vacuum, piped into a specially designed "clean room", picks up the dust right at the machines . . . whisks it away to filter-equipped separators outside the building.
Result: machining is quicker, safer, easier.

Request Catalog No. 1558, "Spencer Vacuum", or write for recommendations on your particular problem.

Also manufacturers of portable vacuum cleaners and pneumatic conveying systems.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

Circle 625 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

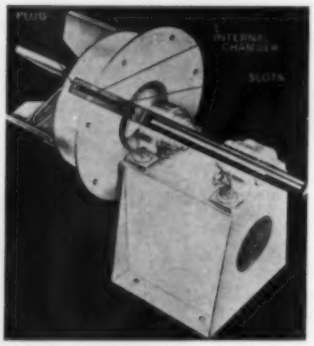
(Begins on page 190)

to resist distortion and provide for deep, more accurately machined end sockets. Bulletin 1013 gives more facts. The Ohio Injector Co.

For details, circle 45 on Post Card

HIGH-TEMPERATURE FAN features air-cooled shaft

A unique shaft which eliminates water cooling, heat slingers and other cooling devices is featured in Thermal-Aire Fans for ovens, furnaces, dryers, etc. Of nickel-chromium steel, it is



designed to function under conditions of high speed, pressure and temperature. As the shaft rotates air is evacuated through four slotted orifices, creating a heat transfer barrier to keep bearing points cool. Garden City Fan & Blower Co.

For details, circle 46 on Post Card

CLEANING UNIT for long lengths of hose

The Patton Hose Cleaning Unit holds enough solvent to clean out several hundred feet of hose on a grease or paint sprayer. And, the solvent can be re-used. It is the size of a 5-gal can, made of heavy steel, and holds 4 gal of solvent. Designed to hang on a tank or sit on ground. Roy C. Patton Co.

For details, circle 47 on Post Card

WATER LEVEL DETECTOR is electric-operated

No pressure connections or compensating devices are used by the Electro Eye-Hye, a system that detects water level with electrodes in a direct-to-drum water column. It is recommended by the manufacturer for pressures to 3000 psi steam, 5000 psi cold. All-electric connections permit placement of single or repeater indicators at any distance. Five indicators are available,

ANOTHER ACHIEVEMENT IN MODERN FLOW CONTROL BY CRANE

this ball beats all!

CRANE BALL VALVES are engineered for superior flow control and minimum-maintenance operation. The secret of this valve's all-around outstanding performance is its beautifully simple, Crane-designed tapered cartridge containing all the working parts. While the valve body remains in line, acting as a pipe connection, the entire cartridge may be removed from the bottom, quickly and easily, for fast exchange or simple, low-cost maintenance.

Precision pre-loaded Teflon* seats assure bottle-tight closing in either direction with a quick, easy quarter turn of the bright, Crane orange insulated handle. The self-aligning, precision machined ball is polished and chrome-plated to reduce friction and wear on the self-cleaning seats. All steel parts are plated for corrosion resistance. Crane Ball Valves handle fluid, gas and air services from vacuum to 800 psi and temperatures from –40 to 400F. Available now from your Crane Distributor for prompt delivery—sizes from ¼" to 2", screwed ends, in bronze, carbon steel, and Type 316 Stainless.

*Registered DuPont trademark.

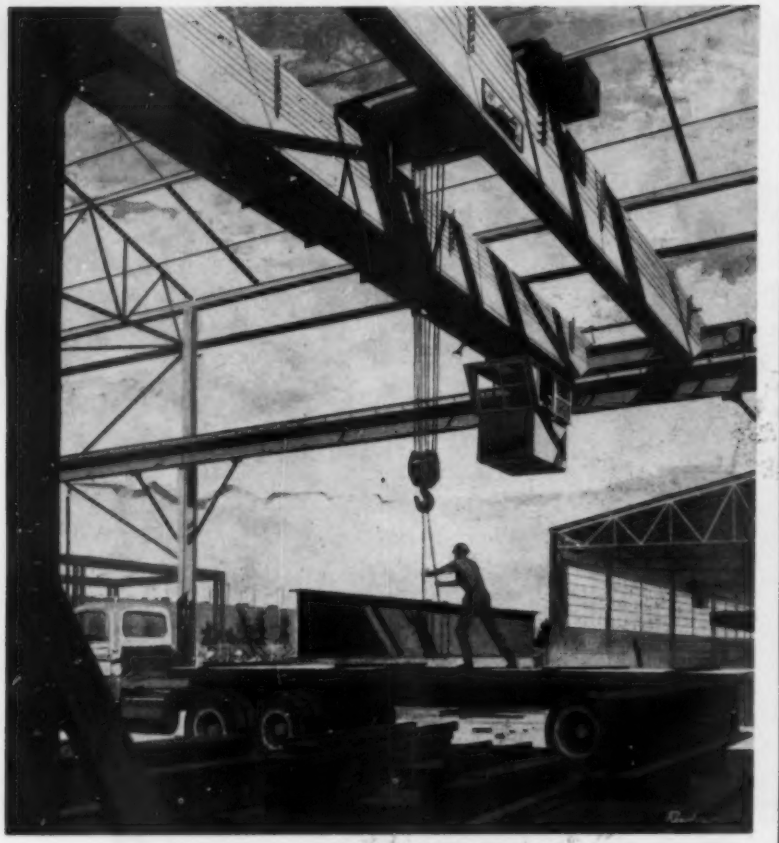
at the heart of home and industry

CRANE

valves
piping • electronic controls
plumbing • heating
air conditioning

Contact your Crane Distributor or write: Crane Co., Industrial Products Group, 4100 S. Kedzie Ave., Chicago 32, Ill., for illustrated brochure ADB 1001 with complete information on Crane Ball Valves. In Canada: Crane, Ltd., 1170 Beaver Hall Square.

Circle 626 on postcard, page 33



WHAT IS A CRANE FOR, ANYWAY?

To handle I-beams. Or castings or machinery or ingots or tanks. Or any of a thousand other things. But mostly to help keep production costs down and profits up.

Products of production in countless variety are handled safely and efficiently by Shaw-Box overhead traveling cranes. Built by Manning, Maxwell & Moore in every type and capacity needed for specific load handling jobs, they help all kinds of businesses save money and make money.

Shaw-Box cranes are seen at work in so many places for other sensible reasons. MMM has the know-how and crane building facilities to solve any load handling problem — and pioneered many innovations that are now standard practice in the crane industry. Today Shaw-Box cranes with pre-engineered and standardized components are a revelation in low first cost and upkeep. And, they have structural and functional plus values that add even more in long-term economy.

Whatever your plans call for in a crane, you will find it well worth knowing all the plus values Shaw-Box cranes have to offer. We invite your inquiry.

MAXWELL MM& MANNING & MOORE INC. TRADE MARK

SHAW-BOX® CRANES
A product of
MANNING, MAXWELL & MOORE, INC.

Crane & Hoist Division • Muskegon, Michigan
Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Circle 627 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

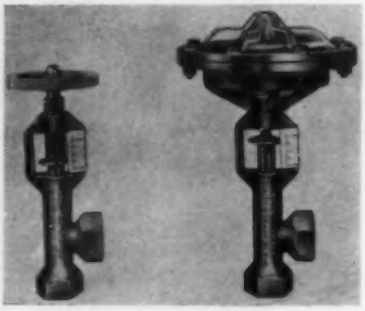
(Begins on page 190)

three are ten-light units, two are digital readouts. Reliance Gauge Column Co.

For details, circle 48 on Post Card

INDICATOR VALVE shows orifice position at-a-glance

Designed for safety and efficiency, this indicator valve has its indicator located on the outside, allowing the orifice position to be seen easily and set accurately. An optional locking handle is



available. Sizes range to 4 in., with a variety of standard tips and seats, including the Micro-Flo for ultra-fine flow. Comes in standard materials, stainless steel, carbon steel with stainless-steel trim, bronze. Pressure ratings to 10,000 psi. Flow Systems, Inc.

For details, circle 49 on Post Card

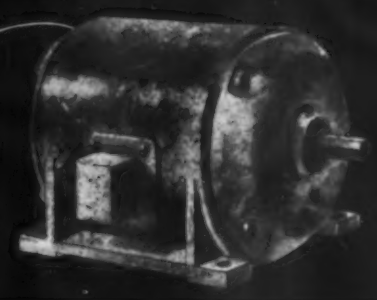
EPOXY PASTE ADHESIVES with four curing agents

Epon Adhesive 901, a solvent-free, gray epoxy paste, can be cured with four versatile liquid agents for a wide range of bonding applications. When mixed with any of these curing agents, the resultant adhesives are thixotropic even during cure at high temperatures. Cured adhesives supply tensile strengths to 3800 psi, resist salt spray, water and most organic liquids. They bond stainless steel, aluminum, titanium and many other metals, rubber, reinforced plastics, glass, ceramics and bondable nylon and Teflon.

The four curing agents, offering cure conditions from room temperature to 300 F, meet most bonding requirements. Curing Agents A, B-1 and B-2 are color indicating, changing the adhesive color from grey to red when paste and liquid are mixed. They have a cured service temperature range to 225 F. The three agents differ in pot life, cure strength of bond etc. Curing Agent B-3 is a dark liquid

REPAIR

Motor failed. Insulation damaged by overheating. Cause: Undervoltage



REPLACE

Electronic tubes and incandescent lamp bulbs burned out--Overvoltage

REJECT

Paint blistered and scorched in infrared drying oven as a result of Overvoltage

Victims of voltage vandalism

Increase production-line efficiency, product quality, and plant profits with General Electric Inductrol® voltage regulators

Repair! Replace! Reject! When voltage plays pranks, production-line efficiency suffers. Machines fail. Lighting efficiency drops. Computers give wrong answers. Motors overheat. Electronic tubes burn out.

These and other costly results of voltage vandalism can be avoided by the use of General Electric Inductrol voltage regulators. And only Inductrol regulators give you all these important advantages:

- Automatic ±1% control accuracy
- Stepless, drift-free control
- 100% overload capacity up to 1 hour
- 97 to over 99% efficiency
- Load, power-factor and frequency compensated
- No harmful waveform distortion
- Rugged, compact construction

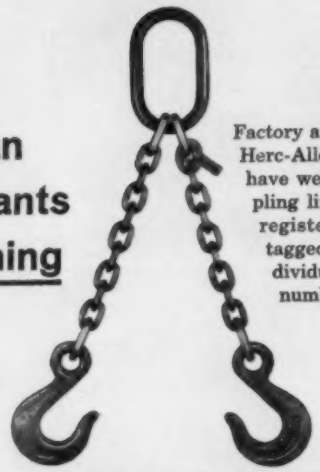
Inductrol regulators are available in three basic types—automatic, motor-driven and hand-operated—and in a wide range of ratings. For full information, call your G-E Sales Engineer. Or write for Bulletin GEC-1450 to General Electric Co., Section 457-08, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 628 on postcard, page 33

For the man who wants everything in chain



Factory assembled Herc-Alloy Slings have welded coupling links...are registered and tagged with individual serial numbers.

HERC-ALLOY
SLING CHAINS

- high resistance to impact loading
- maximum safety for overhead lifting
- lighter weight for easier handling
- long life on toughest jobs

Herc-Alloy is the original alloy steel chain...was the first to be tested, registered and guaranteed in slings ...was the first to be permanently branded with embossed make and grade marks... has been the favorite of many experienced chain buyers since 1933.

Send for the Herc-Alloy Data Book — includes valuable information on the selection, care, use and inspection of slings.

NEED SLINGS IN A HURRY!

Make up your own quality slings with genuine Herc-Alloy components (chain, master links and hooks) and Hammerlok coupling links, all quickly available from your CM Distributor. No peening, no welding. Simple, safe. Ask for Hammerlok instruction folder.

Call your CM chain distributor

COLUMBUS McKINNON CHAIN DIVISION
COLUMBUS McKINNON CORPORATION
TONAWANDA, N. Y.
NEW YORK (Mountainside, N.J.) • CHICAGO
CLEVELAND • SAN FRANCISCO (Factory Branch)
In Canada: COLUMBUS McKINNON LIMITED, ST. CATHARINES, ONTARIO

HERC-ALLOY®
HAMMERLOK®

RUGGED • DURABLE
CM® CHAIN

Circle 629 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

providing a high strength adhesive with a pot life of 6 hr at 75 F, service to 350 F. Shell Chemical Co.

For details, circle 50 on Post Card

BATTERY STAND combines convenience and safety

This battery charging stand permits assembly of complete truck battery charging equipment in one compact station, with charger off the floor and out of potential damage area. It consists of a two-platform steel stand, with upper platform on steel uprights to solidly support battery charging units, and lower platform designed with two parallel sections of steel roller conveyors to receive and hold batteries. H. B. Sackett Screen & Chute Co.

For details, circle 51 on Post Card

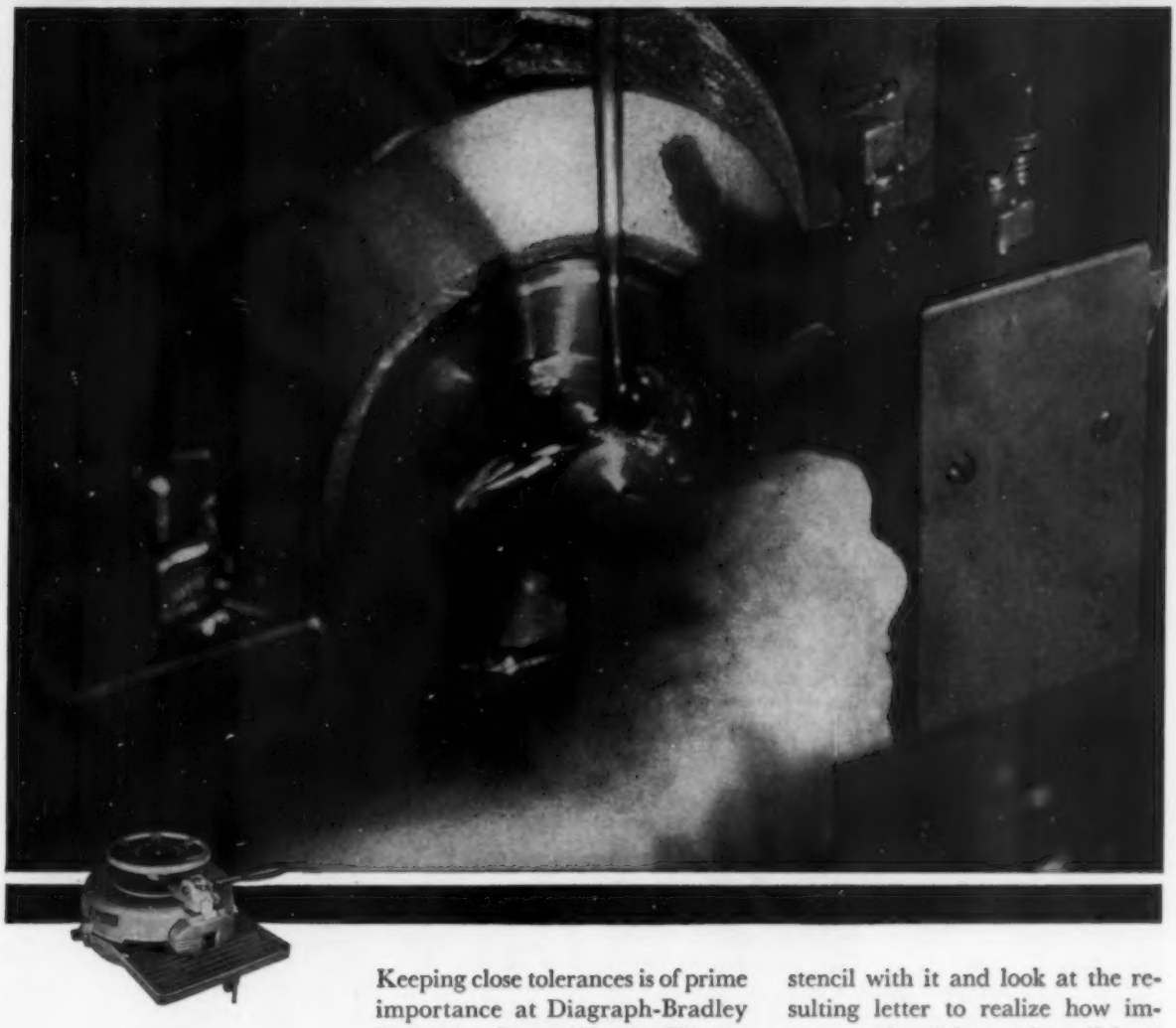
ALGAE INHIBITOR for non-potable water systems

Used in cooling towers, air conditioning systems and other similar applications Formula D-130 kills and prevents algae growths. It is supplied in concentrate form, may be added to systems at different feed rates. Composed of a mixture of chlorinated phenolic compounds, it contains no mercury, copper or iodine and is compatible with water treatment chemicals. The Bird-Archer Co.

For details, circle 52 on Post Card

TWO-WAY RADIO is lightweight, easy-to-carry

The Voice Commander, a battery-operated VHF-FM two-way radio, has its transmitter and receiver in one case. It is 9½ in. high and weighs about 3 lb. Manufactured for high band frequencies (132-174 mc) with one watt transmitter RF power output, it is claimed the highest power output for a



COOL CUTS

Keeping close tolerances is of prime importance at Diagraph-Bradley Industries, Inc., of Herrin, Illinois, leading manufacturer of stencil machines and accessories. One of the ways this is accomplished is by keeping cutting edges cool.

At Diagraph-Bradley stencil punches must be cut and held within .0005 of an inch—a fine point of precision Diagraph-Bradley attributes to the cooling and lubricating effect of Cities Service Chillo 10 cutting oil.

"You have only to take a Diagraph-Bradley machine," says one of the company officials, "cut a stencil with it and look at the resulting letter to realize how important the right cutting oil is to our production."

Cities Service Chillo 10 oil is a sulphochlorinated oil. The concentrations of sulphur and chlorine are stabilized by a special process, assuring uniformity of action through the entire cutting operation.

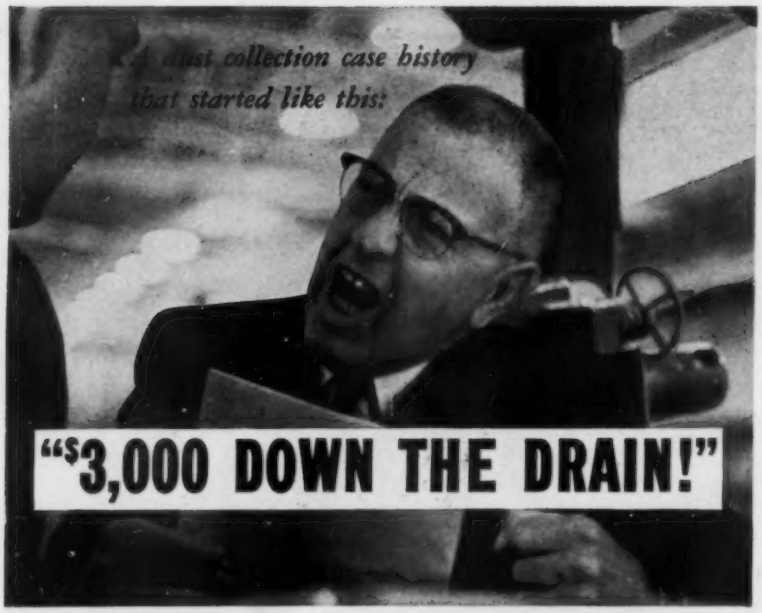
That's why, with Cities Service Chillo 10 cutting oil, work is always more accurate, clean and cool!

For full information call your nearest Cities Service office or write Cities Service Oil Company, Sixty Wall Tower, N.Y. 5, N.Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Circle 630 on postcard, page 33



"Get rid of that DUST!"

"The boss was sore and I was on the spot.

"He shoved the report from the efficiency engineer at me. I read it: 'Yearly loss due to machine wear, misalignment and down time . . . $3,000. Major cause . . . abrasive dust.'

"The boss pointed his finger at me, 'Get rid of that dust and get rid of it fast!' "

Now, it was my problem, and I was on the spot.

"First thing I did was to check into a central dust collecting system. But the lowest bid I could get was $8,000. Too much.

"Then I came across a Torit ad, offering economical portable dust collectors.

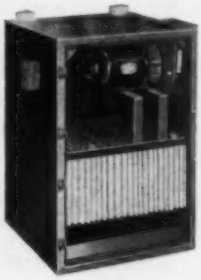
"Two days after my call Torit engineers showed me how in only one week they could install a portable, unitized Torit Dust Collector at each of our eight grinders, trapping dust right at its source—cleaning the air throughout the entire plant.

"Total cost? Only $2400.00. That's a $5,600.00 saving over the lowest priced central system.

"You guessed it—we installed the eight Torit Collectors."

Torit solved my problem

"This year when we received our report it read: 'Loss due to machine wear, misalignment and down time...$340.00.' A saving of $2,660.



"This time the boss was all smiles. He slapped me on the back, 'Charlie, you did a fine job getting rid of that dust. Frankly, I didn't think it could be done with such a small investment.'

"Now there's a pretty nice fellow to work for.

"If you've got a dust problem, or are about to have one, write the Torit people. They've manufactured and sold more dust collectors than anyone else in the U.S.A. Chances are they can help you the way they helped us."

TORIT manufacturing company

1133 Rankin St., St. Paul 16, Minn., Dept. 1811

Circle 631 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

small-case unit. Its two-section slide-open case, has a handle that also serves as an auxiliary antenna, and a built-in collapsible telescopic antenna extends for transmission and improved receiver performance. Optional earpiece and lapel speaker are available. Provision is also made for using a tiny external microphone. General Electric Co.

For details, circle 53 on Post Card

FLOODLIGHT for versatile, efficient lighting

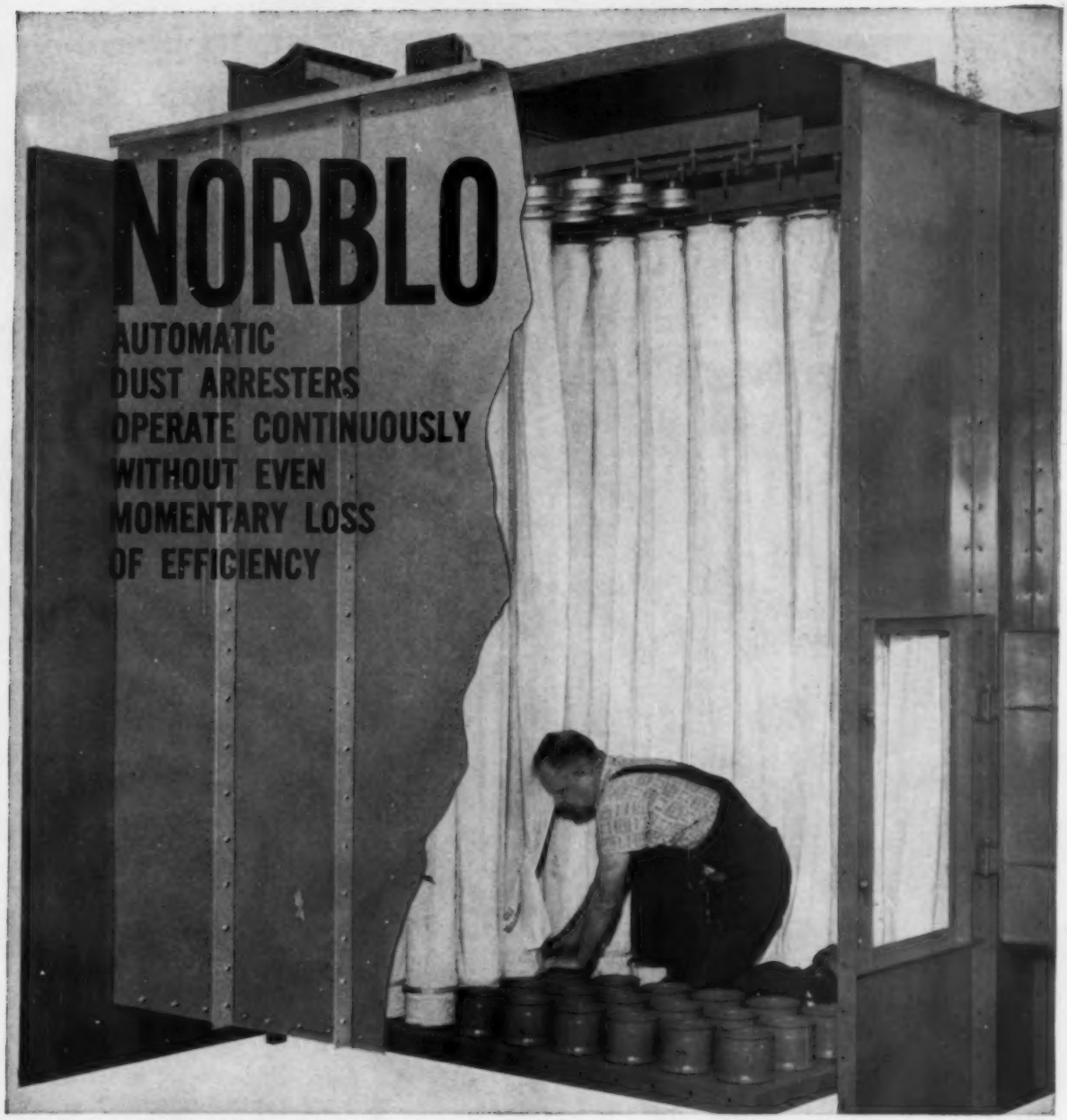
Included among features of Generalflood, an Intenso Floodlight, are easy installation, convenient service from front or rear, self-centering inner reflector, and a filter wick to keep reflector and cover glass free of dirt

and condensation. Two sizes are available. The 14-in. diam accepts 300- to 500-w incandescent or 250-w mercury vapor lamps; the 16-in. unit accepts 750- to 1500-w incandescent or 400-w mercury vapor lamps. Open or enclosed types are available. Bulletin GF 860 gives information. Appleton Electric Co.

For details, circle 54 on Post Card

PUSHBUTTON SWITCH has 10-amp capacity

This illuminated pushbutton switch provides one-button control of two circuits, and is available with momentary-action or alternate-action design. The former switches circuits as long as pushbutton is depressed, returns to original position and circuit when released. With alternate-action design, the pushed button remains in operated position until pushed again and then springs back to original position. Red, white, blue, green or yellow translucent buttons in four sizes and shapes are available. Contact arrangement of switch elements is two-circuit double-



Periodic cleaning, repair or replacement of bags, and minor maintenance can be accomplished while the collector remains in operation. One compartment, as shown above, can be isolated in the Norblo design, with all mechanical parts outside the gas stream. Continuous cyclic shaking, by compartment, allows operation without interruption. ■ This is why in modern plant operations you'll find an increasing preference for Norblo Automatic Bag Arresters. Where efficient production requires continuous operation more and more industries specify Norblo Dust Arresters. Over 80% of the cement industry relies on Norblo equipment for drying, grinding and finishing operations. ■ Buell-Norblo equipment can play an essential part in your process. Write for complete information on any type of dust collection problem. Buell Engineering Company, Inc., Dept. 14F, 123 William Street, New York 38, New York. Northern Blower Division, 6423 Barberton Avenue, Cleveland, Ohio. Electric Precipitators · Cyclones · Bag Collectors · Combination Systems · Fans · Classifiers.

buell Norblo

Circle 632 on postcard, page 33

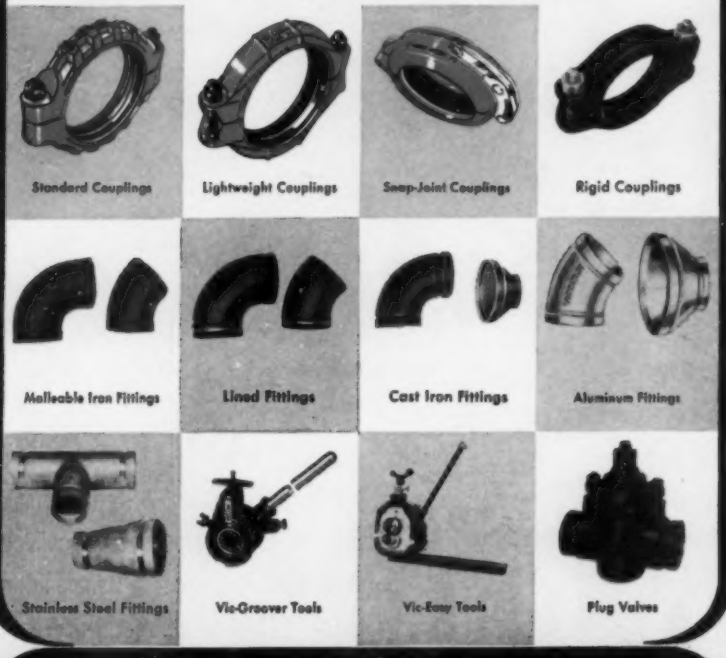
let VICTAULIC cut your piping costs

NEW PLAINLOCK COUPLINGS AND FITTINGS

For Low Cost Jointing of Plain End Pipe

- Speed Installation — Save Time and Labor — Cut Piping Costs
- No pipe end preparation
- Positive grip of pipe ends
- Low cost couplings and fittings
- Join standard or light wall carbon or stainless steel, aluminum and other piping materials

CUT COSTS WITH OVER 1100 VICTAULIC ITEMS FOR BETTER AND EASIER PIPING



For complete information on any Victaulic product, write:

VICTAULIC COMPANY OF AMERICA

P.O. Box 509, Elizabeth, N.J.

Circle 633 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

break, electrical rating is 10 amp at 125 or 250 v a-c, 30 v d-c. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

For details, circle 55 on Post Card

MICROSCOPE lights up, measures to 0.0005 in.

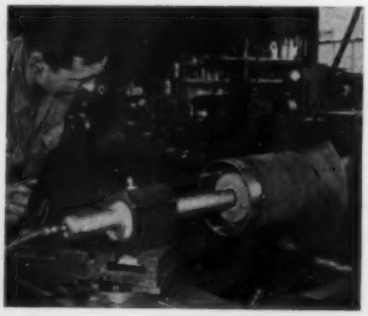
Designed for on-the-spot use in laboratory, shop or field, the pocket-sized Illuminated Measuring Microscope features zoom-type magnification. The ranges, from 27x to 40x, up to 82x to 120x, and measuring scale, from

0.002 in. to 0.005 mm, can be selected by changing eyepieces. Self-illumination is provided by both integral flashlight and a transformer that plugs into 110 v a-c. A 1-in. eye relief permits use while wearing glasses. It is priced around $50.00. National Instrument Co., Inc.

For details, circle 56 on Post Card

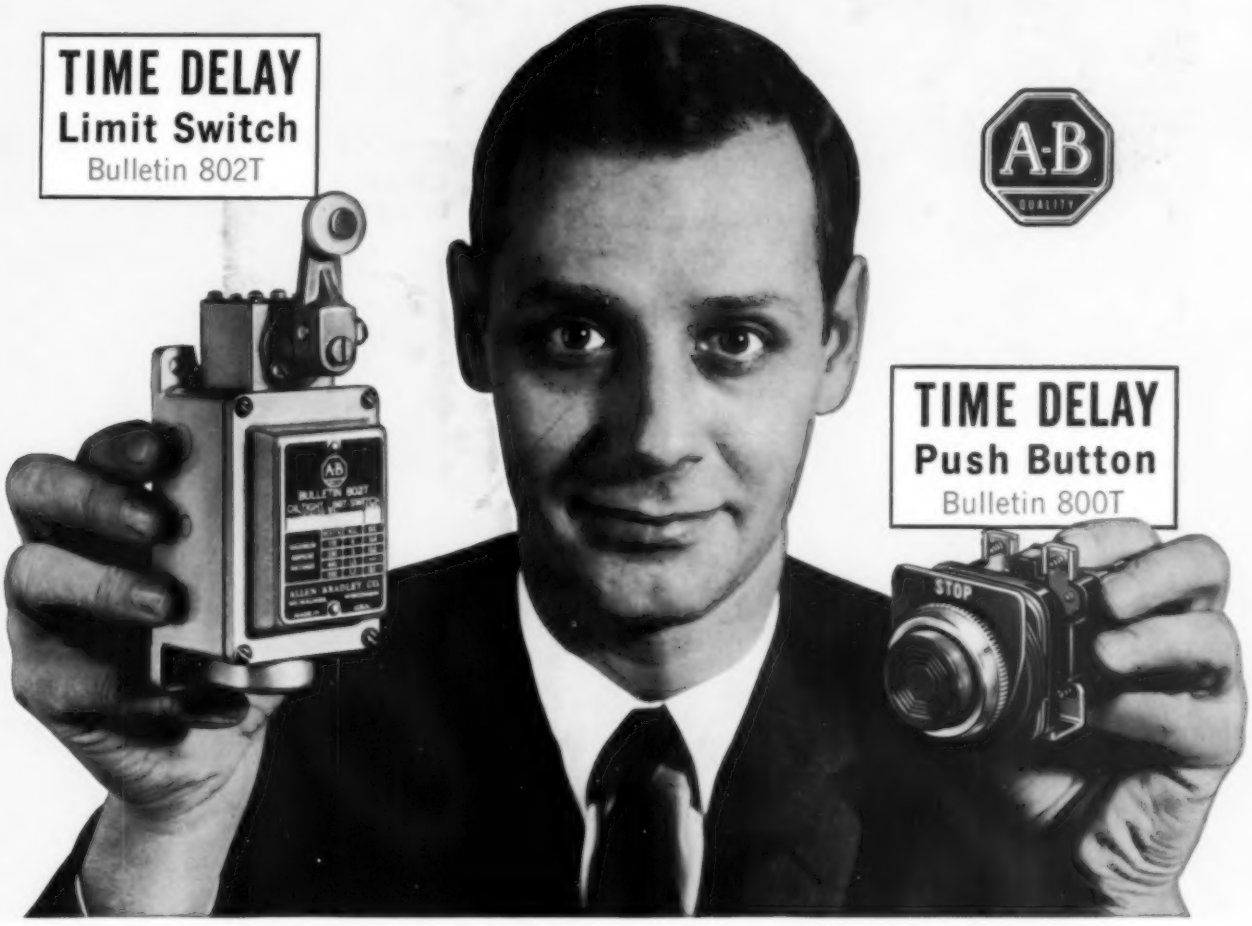
TOOL GRINDER gives full visibility during operation

T-P Tool Post Grinder uses the same quill for internal or external grinding. Operation is by a 1-hp air motor enclosed inside the quill, with a top speed of 18,000 rpm and maximum spindle speed of 4500 rpm. Speed can be changed by adjusting the air supply



Circle 634 on postcard, page 33

Something NEW...
designed for your convenience



Adjustable From 1 to 15 Seconds

This new Allen-Bradley development should solve such occasional problems where, upon the operation of the push button or limit switch, a slight time delay should occur. Time delay is adjustable up to 15 seconds—and it can also be introduced when "stopping" the operation—but not in both the "starting" and "stopping" cycle.

Both push button and limit switch are relatively low in cost—ideal for applications where a delay of only a few seconds is desired, and where the repetitive accuracy of the Allen-Bradley Bulletin 849 time delay relay is not necessary. Both units have single pole, double break contacts—either normally open or normally closed. They are no more difficult to install than the corresponding units without the time delay feature.

Machine tool and production system designers should have full information in their files on these new Allen-Bradley time delay push buttons and limit switches. It is yours for the asking. Write today.

12-61-RM

ALLEN-BRADLEY

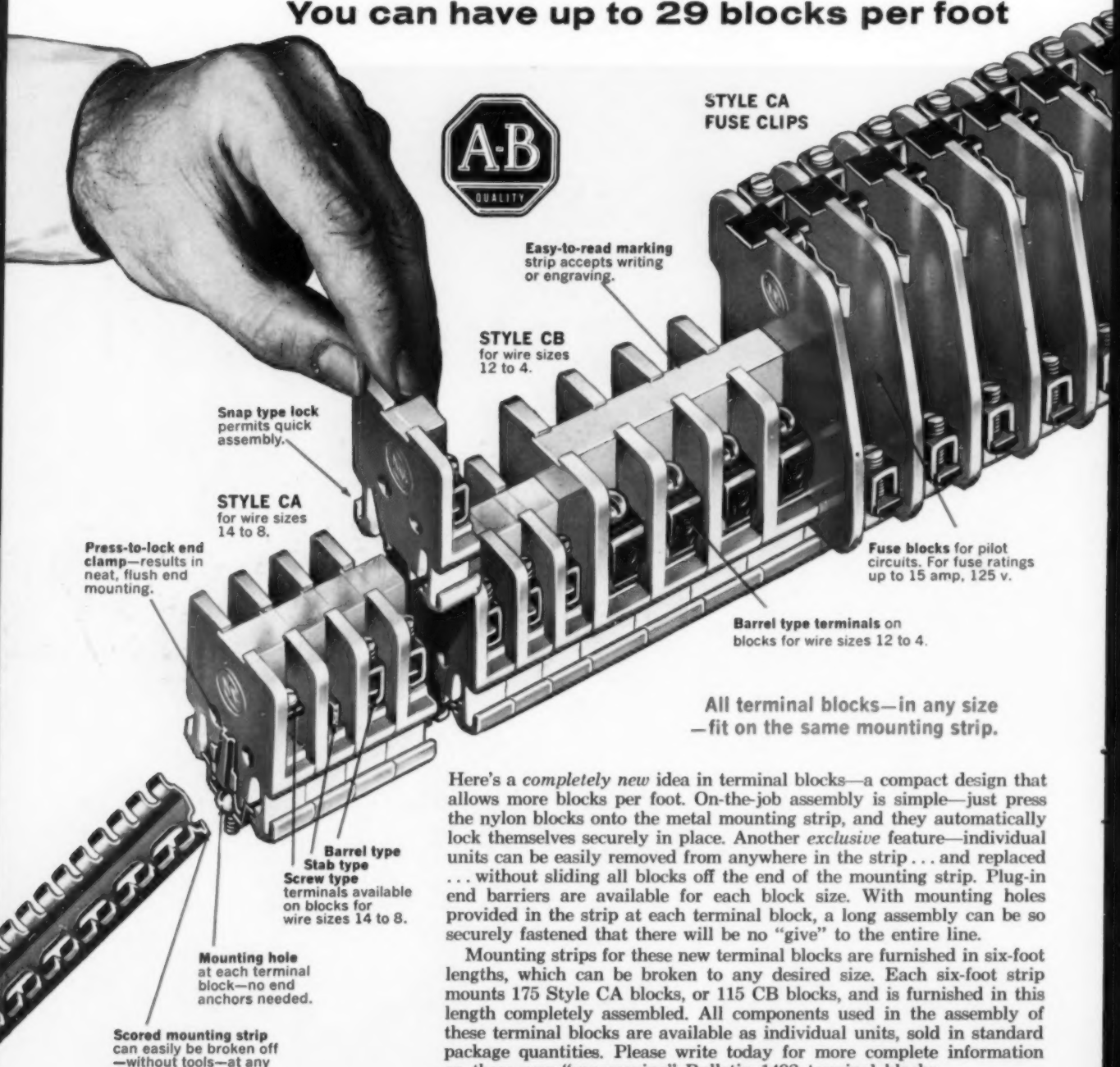
Member of NEMA

Allen-Bradley Co., 318 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

New ALLEN-BRADLEY BULLETIN 1492 SNAP-ON TERMINAL BLOCKS *save space*

You can have up to 29 blocks per foot


A-B QUALITY
STYLE CA FUSE CLIPS
Easy-to-read marking strip accepts writing or engraving.
STYLE CB for wire sizes 12 to 4.
Snap type lock permits quick assembly.
STYLE CA for wire sizes 14 to 8.
Press-to-lock end clamp—results in neat, flush end mounting.
Fuse blocks for pilot circuits. For fuse ratings up to 15 amp, 125 v.
Barrel type terminals on blocks for wire sizes 12 to 4.
Barrel type
Stab type
Screw type
terminals available on blocks for wire sizes 14 to 8.
Mounting hole at each terminal block—no end anchors needed.
Scored mounting strip can easily be broken off —without tools—at any desired length.

All terminal blocks—in any size —fit on the same mounting strip.

Here's a *completely new* idea in terminal blocks—a compact design that allows more blocks per foot. On-the-job assembly is simple—just press the nylon blocks onto the metal mounting strip, and they automatically lock themselves securely in place. Another *exclusive* feature—individual units can be easily removed from anywhere in the strip . . . and replaced . . . without sliding all blocks off the end of the mounting strip. Plug-in end barriers are available for each block size. With mounting holes provided in the strip at each terminal block, a long assembly can be so securely fastened that there will be no "give" to the entire line.

Mounting strips for these new terminal blocks are furnished in six-foot lengths, which can be broken to any desired size. Each six-foot strip mounts 175 Style CA blocks, or 115 CB blocks, and is furnished in this length completely assembled. All components used in the assembly of these terminal blocks are available as individual units, sold in standard package quantities. Please write today for more complete information on these new "spacesaving" Bulletin 1492 terminal blocks.

13-61-RM

ALLEN-BRADLEY

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

PLANT ENGINEERING EQUIPMENT

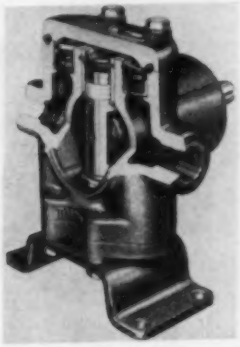
(Begins on page 190)

valve. The complete assembly is 1-⅞ in. diam. Only one bolt is needed to lock the eccentric and hold the assembly on the lathe compound. The eccentric provides a ⅞-in. vertical adjustment for ease in moving. Gilmore Industrial Grinders, Inc.

For details, circle 57 on Post Card

PISTON PUMP for high pressure applications

Hypro Small-Twin Model 5300 is a direct motor driven two-cylinder unit that handles a variety of solutions and suspension-type chemicals and will op-



erate at pressures to 500 lb. Weighing only 9 lb, it is offered in 2- and 3-gpm sizes, maximum speed of 1800 rpm. Typical uses include high pressure washing of equipment, buildings, trucks; boiler feed, hydrostatic testing, atomizing liquids, metering, pressure boosting. Hypro Engineering, Inc.

For details, circle 58 on Post Card

MONITORING SYSTEM initiates needed remedial action

This multi-channel high speed alarm monitoring system is designed to automatically monitor hundreds of points to detect off-normal operation, operate an alarm and initiate remedial action within seconds. High and low alarm limits are predetermined for each monitored point and the points stored in the system's memory. As each point is examined, sequentially, the value of the quantity with the predetermined limits is compared. The comparator converts the scanner output signal to a digital number and compares it with the digital numbers stored in the memory. Any quantity which can be converted to an electrical signal can be monitored. Several memories are available for use. Low speed scanning units scan at the rate of 10 points per second, high speed

Quick way to get up-to-date on the use of new plastics

Call your nearby Polymer Distributor for a *Polymer* "*Parade of Plastics*" presentation of the newest and most important industrial plastics applications. See for yourself how progressive industries are now putting plastics to work cutting material costs, improving performance and extending the life of parts in all types of machinery and equipment.

You'll get valuable tips on new design possibilities as well as time and money-saving ideas for new maintenance and tooling improvements. *Polymer* "*Parade of Plastics*" will bring you up-to-date on new availabilities . . . new and different applications that may be the answer to your immediate problem or the long-range solution to others in your plant.

"It pays to keep posted on plastics, and *Polymer 'Parade of Plastics'* is the fast, easy way to do it . . . without obligation, of course."

Set up a date today with your Polymer Distributor for an individual interview or a group meeting.

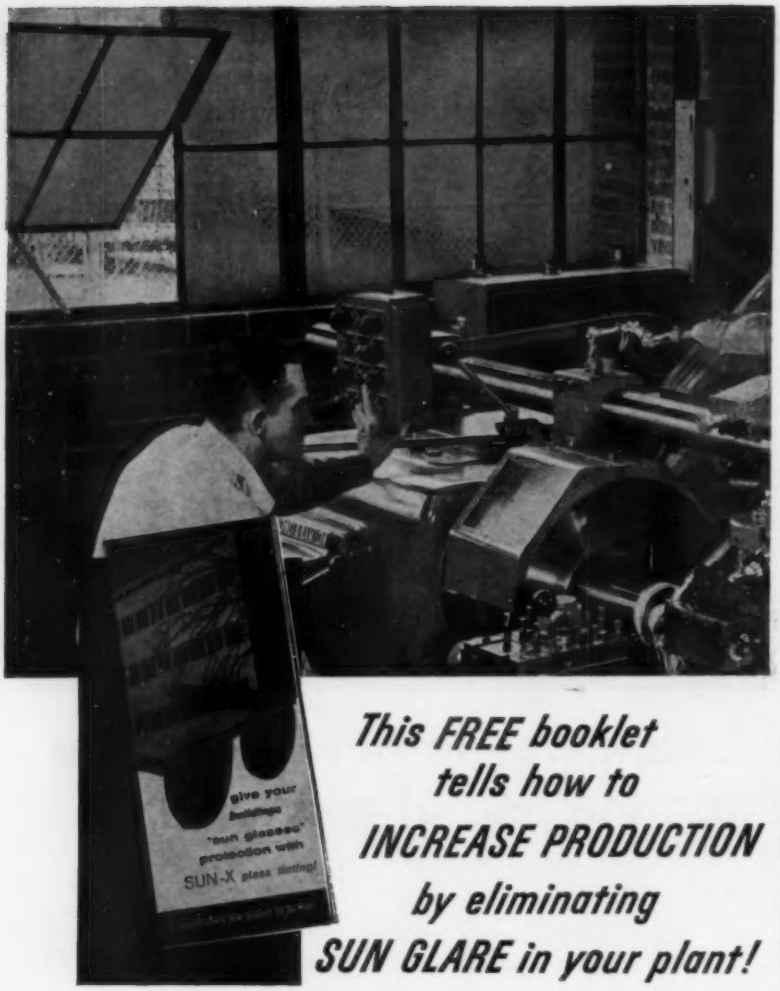
POLYPENCO

THE POLYMER CORPORATION
Fabricated Parts Service
Reading, Pa. / Export: Polypenco, Inc., Reading, Pa., U.S.A.

Plastics Engineering in Action

NYLONS • TFE-FLUOROCARBONS • OTHER PREMIUM PLASTICS

Circle 635 on postcard, page 33



This FREE booklet tells how to INCREASE PRODUCTION by eliminating SUN GLARE in your plant!

Sun glare causes eye strain and fatigue . . . reduces worker output . . . increases mistakes and spoilage . . . increases accidents. And now there's a new Du Pont product that lets you eliminate sun glare in your plant—without the expense of installing factory-tinted glass in your windows!

Sun-X Glass Tinting is applied to your *existing* windows, and eliminates up to 94% of the sun's rays that cause glare . . . up to 95% of the rays that cause fade . . . up to 69% of the sun's heat rays!

Get all the facts—send for the colorful free booklet on Sun-X Glass Tinting. Find out how easily you can block out the sun's damaging rays to increase production and give a more comfortable working light in your plant! Just mail the no-obligation coupon!

SUN-X GLASS TINTING

Manufactured by Du Pont

DUPONT

INTERNATIONAL DISTRIBUTORS AMERICAN GLASS TINTING CORPORATION

AMERICAN GLASS TINTING CORP. Dept. CA-111
P. O. Box 6565 • Houston 5, Texas

Please send free colored folder on solving sun problems

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 636 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

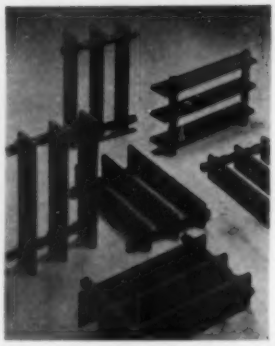
(Begins on page 190)

units at the rate of 1000 points per second. The cost of a system depends on specific requirement. Control Equipment Corp.

For details, circle 59 on Post Card

CERAMIC COATING for steel industrial grating

Fused to steel grating of any design, at furnace temperatures of 1600 F, this ceramic coating provides a matte-type, non-skid surface. It needs no painting. The fusion of refractories, silicates and metallic oxides to the steel core eliminates undertravel or separation between coating. If me-



chanical damage occurs, extending into the steel core, oxidation is confined to the point of damage with no lateral creep. According to manufacturer, it is resistant to weather, most acid, alkali and caustic exposures, and normal traffic. The material can be welded and torch cut for openings. Cost is reported within the range of hot-dipped galvanized grating. Allied Material Supply Co.

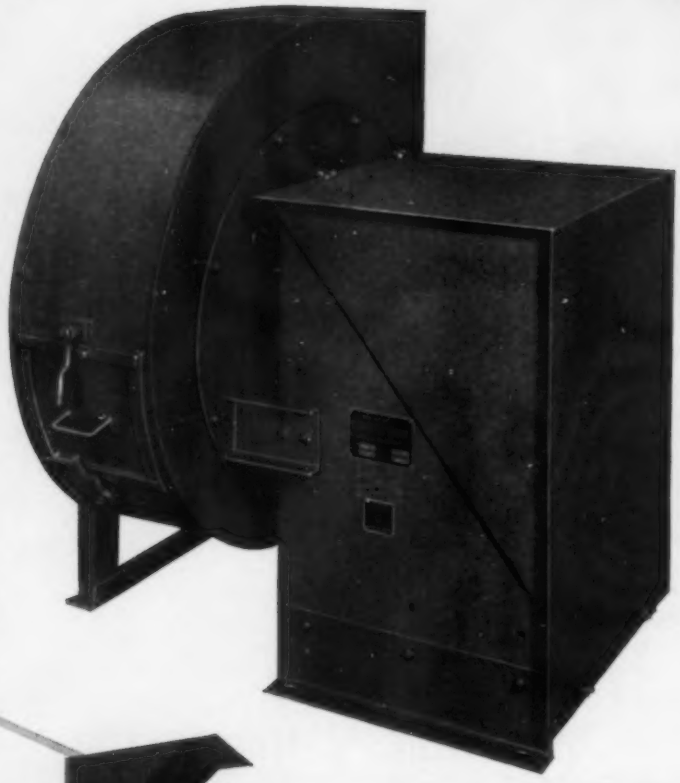
For details, circle 60 on Post Card

PRIMER reduces maintenance of composition floors

First Coat won't yellow composition floors, says manufacturer, and it gets top mileage out of dressings. A water-emulsion based primer, First Coat is applied with a clean string mop and forms a hard, odorless film which fills the pores of the floor. It also serves as a barrier between chemical action of the floors and dressings and cleaners used upon them. Suitable for asphalt tile, vinyl, vinyl asbestos, linoleum, rubber tile and terrazo, First Coat is recommended for two types of composition floors: porous ones on which no dressing can be expected to perform well unless pores are sealed off, and

CLARAGE

NEW... Packaged INDUSTRIAL FANS



Contact the nearest Clarage sales engineering office for full information on this new line of equipment.

Ready-to-run

NOW the highly regarded Type XL industrial fans have joined the expanding family of Clarage self-contained, packaged units.

Hinged cover completely encloses motor, drive, and bearings for weatherproof installation outdoors or for added safety on indoor applications.

These compact, rugged, economical units are available with either the open type wheel for handling materials or the high efficiency backplate wheel for light dusts and fumes.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

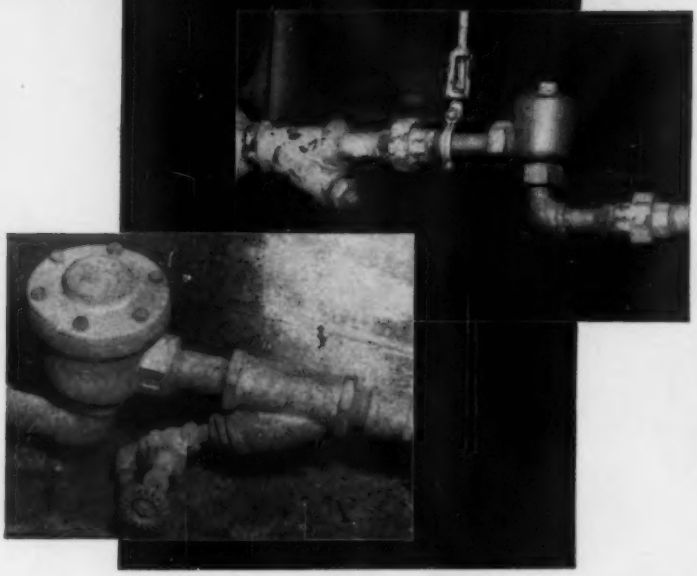
Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

Circle 637 on postcard, page 33

Consider These Facts about **THERMOSTATIC TRAPS**

TO ASSURE HIGH EFFICIENCY AND LOW MAINTENANCE



Every trapping requirement cannot be met with one trap. Consequently Anderson manufactures a complete line of traps including the remarkable Quik-Flex Thermostatic Steam Trap. From one source you can meet all your trapping needs. If you are using or planning to use thermostatic traps, consider these important facts—features built into every Anderson Quik-Flex Trap.

- **Large capacity covering a wide pressure range simplifies specifications.**
- **Only one moving part assures low maintenance and less downtime.**
- **Fast heating up of units through quick discharge of condensate and/or air.**
- **Guaranteed freeze-proof when properly installed and operated for outdoor operation.**
- **Compact design permits simplified piping in hard-to-get-at places.**
- **Immediate delivery is guaranteed from inventory.**

Write FOR COMPLETE INFORMATION AND BULLETIN 257 DESCRIBING THE ANDERSON QUIK-FLEX THERMOSTATIC TRAP.

SUPER SILVERTOPS STEAM TRAPS
BY THE MANUFACTURERS OF Hi-eF PURIFIERS

THE V. D. ANDERSON COMPANY
Division of International Basic Economy Corporation
1939 West 96th Street • Cleveland 2, Ohio
Circle 638 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

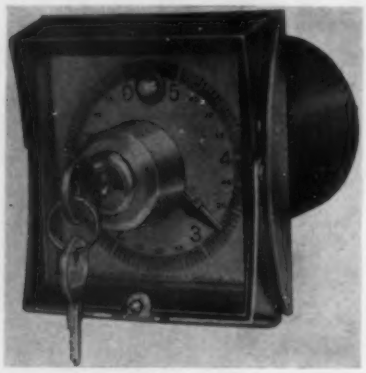
problem floors where chemical action of tile is a factor.

Tests on old and new resilient floors are reported to show that First Coat eliminates or minimizes cleaning difficulty, excess scuffing, powdering of resin dressings, slipperiness, poor gloss and abbreviated dressing life. Masury-Young Co.

For details, circle 61 on Post Card

RESET TIMER is set and locked by key

Time setting by key limits access to Bulletin 125 Cycle-Flex Plug-in Reset Timer to qualified personnel only. The key itself performs the dial setting.



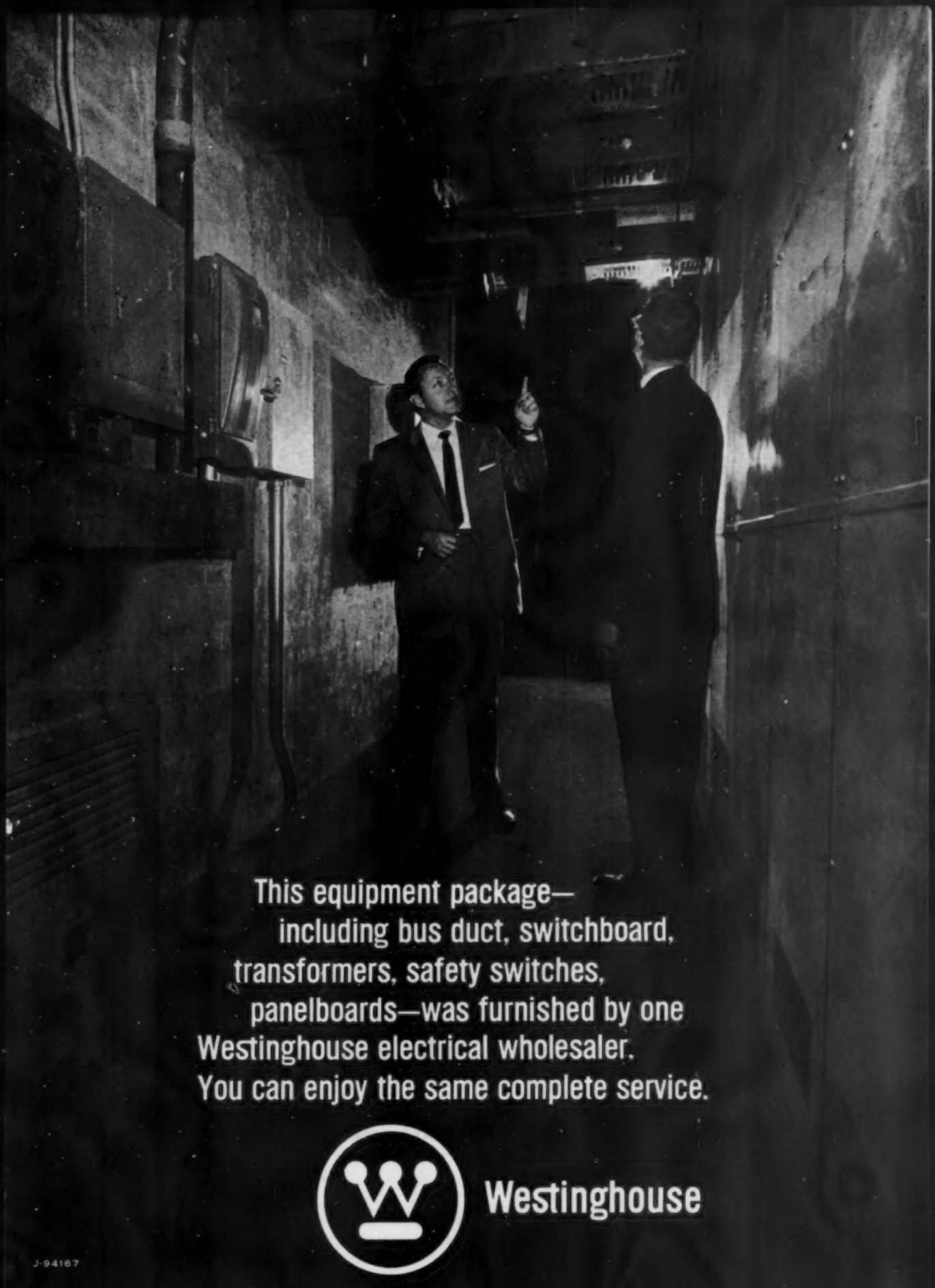
When removed, desired setting is automatically "sealed in". Pilot gives visual indication of time period, but may be installed to show "timed out" or reset position. Eagle Signal Co.

For details, circle 62 on Post Card

PRESSURE FILTERS are tubular element type

These tubular element pressure filters are for filtering of cooling water to remove silt, condensate to remove oil and suspended corrosion products, process water to remove trace contaminants, and for clarification of drinking water. Filters are polishing type, can remove particles as small as 1 micron. Tubular elements are either plastic (for water up to 140 F) or stainless steel for higher temperatures. The filter is prepared by precoating with a filter aid, such as diatomaceous earth. During filter runs, filter aid "body feed" is added continuously to the unfiltered water. Suspended particles and the high porosity filter aid build up on the thin precoat layer, keeping it open and porous so

Circle 639 on postcard, page 33 ➔



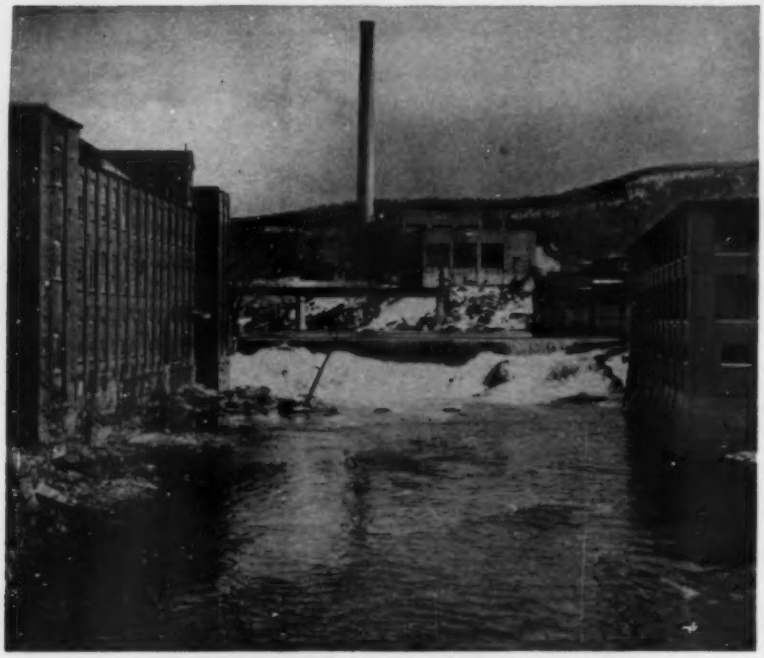
This equipment package—
including bus duct, switchboard,
transformers, safety switches,
panelboards—was furnished by one
Westinghouse electrical wholesaler.
You can enjoy the same complete service.

Westinghouse

J-94167

at Ware Industries...

HAGAN COAGULANT AID CUTS CLARIFYING COSTS BY 53%



Ware Industries, Ware, Massachusetts, owns and operates this complex of buildings, leasing them to several textile manufacturers.

Quick case history — reading time 68 seconds

THE PLANT: Ware Industries owns and operates a group of huge manufacturing buildings. Tenants are textile manufacturers, most of whom produce high quality, pastel colored woolens. Ware provides building maintenance and power, steam and process water.

THE PROBLEM: Ware River water carries some plant effluent and heavy run-off from fields and forests. Color averages from 50 to 60 ppm, but may run as high as 80 to 90 ppm. Due to the delicate woolen colors produced, maximum tolerable water color is 5 ppm. The plants use 1½ million gallons of water per day, and clarification with alum and caustic soda had produced acceptable water, but chemical costs were high.

THE SOLUTION: After several unsuccessful attempts to use a coagulant aid, Hagan Coagulant Aid No. 323 was tried. Because it produces a larger, tougher floc that settles fast, the Hagan Aid proved to be the solution to the problem. Hagan Aids are easy to feed, are non-toxic and are available in a range of formulations to suit most water conditions.

RESULTS: Results were spectacular. Alum use fell from 1400 pounds per day to 500 to 600 pounds per day. Use of caustic soda also dropped. Only two quarts of Hagan Coagulant Aid are used per day. Chemical costs have been cut by 53%, nearly $10,000 annually.

WANT MORE INFORMATION on the ability of Hagan Coagulant Aids to solve clarification problems? **Write or phone for Bulletin HSP-919.**

Hagan Aid is measured prior to mixing.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

HAGAN DIVISIONS: CALGON CO. • HALL LABORATORIES • BRUNER CORP.

Circle 640 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

that long filter runs are possible. An "air bump" backwash cleans elements and filter membrane. The filters are available in 11 standard sizes, can be used in multiples for high flow rates. Hagan Chemicals & Controls, Inc.

For details, circle 63 on Post Card

SWITCH has lighted handle easy to find in the dark

This lighted handle rocker type switch has a neon lamp in back of its translucent rocker button that gives off a soft glow when in the "off" position. When

"on" the rocker is not lighted. It is rated at 15 amp, 120 v a-c. Available with wide or narrow rocker, in single pole or three way. Pass & Seymour, Inc.

For details, circle 64 on Post Card

ADAPTER for temporary three-wire conversion

Duplex Grounding Adapter offers a fast means of converting a standard two-wire duplex wall receptacle used

with grounded or ungrounded electrical systems to temporary three-wire grounding receptacles. With these polarized adapters, an entire building can be converted overnight and just as quickly changed back again. It has advantages in areas of existing buildings requiring temporary three-wire grounding receptacles for maintenance, power tools and other equipment.

Hydraulic presses should work smoothly, with no jerk or erratic action. But sludge and varnish in an Eastern plant's presses caused uneven operation, with increasing "rejects."

A Sinclair lubrication engineer recommended Sinclair's new DURO hydraulic oils with oxidation, rust and foam inhibitors. Result: outstanding performance, with "rejects" cut to minimum.

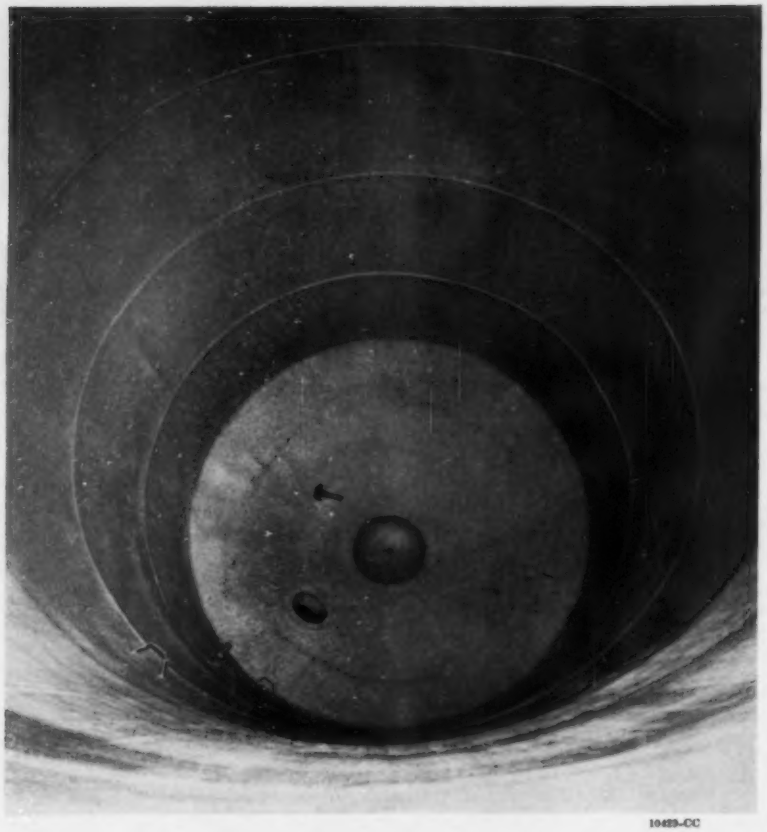
Let Sinclair tackle (and solve) your plant problems. Call your local representative or write...

Sinclair

SINCLAIR REFINING COMPANY

TECHNICAL SERVICE DIVISION • 600 FIFTH AVE., NEW YORK 20, N.Y.

Circle 641 on postcard, page 33



10429-CC

CEILCOTE CORROSION-PROOF COROLINE 505 TANK LININGS

COROLINE 505 LININGS . . . reinforced with Type "F" glass cloth are used for handling hot detergents. Other applications include: Chemical Storage tanks, processing tanks, pickling and plating tanks, pits and foundations. Tough, durable and long-lasting, COROLINE 505 provides proven resistance to most acids, alkalis and solvents . . . and, features good temperature resistance without permitting age hardening.

EASY APPLICATION IN SHOP OR FIELD: Applied in a "build-up" process, COROLINE 505 works easily with either trowel or brush. For steel or concrete surfaces, COROLINE 505 is generally reinforced with glass cloth. Application thicknesses vary from 1/32" to 3/16" depending on required operating conditions.

Send today for the CEILCOTE COROLINE BULLETIN . . . it contains all the facts.

CEILCOTE COMBINES MINDS, METHODS AND MATERIALS . . .

. . . for the design and construction of CORROSION-PROOF equipment and installations for all industries.

CEILCOTE

THE CEILCOTE COMPANY, INC. • 4915 Ridge Road • CLEVELAND, OHIO

Circle 642 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

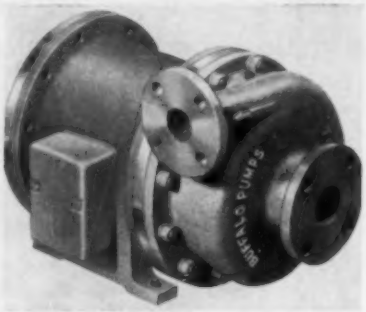
(Begins on page 190)

Cover-plate screw of existing receptacle is removed and new adapter plugged into receptacle. A captive mounting adapter screw is threaded into place and establishes ground contact through wiring system. Harvey Hubbell Co.

For details, circle 65 on Post Card

CENTRIFUGAL PUMPS have leakproof, hermetic seal

Totally enclosed and hermetically sealed, these centrifugal pumps are for use with toxic, inflammable or highly volatile liquids. Design includes self-



adjusting bearing. With discharges ranging from 1 to 5 in., standard units are for 120 psig, 40 through 250 F. (Higher ratings available on special models.) Automatic thermo-protectors imbedded in stator rotor windings prevent motor burn-out. Buffalo Forge Co.

For details, circle 66 on Post Card

SOLENOID VALVE takes vibration, high pressure

For normally-closed operation to 1000 psi, this two-way solenoid valve withstands vibration at 20-1000 cycles at 10G without shifting position. It will handle diesel fuel, kerosene and gasoline from —65 to 150 F and may be mounted in any position. Available in 3/8 in. NPT pipe size, with brass body and seat Viton A disc. Form V5128 gives data. Automatic Switch Co.

For details, circle 67 on Post Card

ADHESIVE resists water, chemical, weather, oil

CD Cement 350, a general purpose, high-solids adhesive, claimed the strongest flexible adhesive available, is for bonding natural and synthetic rubber, vinyl plastic, fabric, leather, wood to itself or glass, and many other surfaces. It is permanently flex-

Circle 643 on postcard, page 33 ➔

AVAILABLE FOR IMMEDIATE DELIVERY
FROM YOUR LOCAL STEEL SERVICE CENTER

INLAND STEEL COMPANY 30 W. Monroe St. - Chicago 3, Ill.

STEEL SERVICE CENTER INSTITUTE

INLAND

PLANT ENGINEERING EQUIPMENT

(Begins on page 190)

ible, tough, fast-setting, resistant to oil, gasoline, chemicals. Chemical Development Corp.

For details, circle 68 on Post Card

TOOL frees frozen grease fitting with hammer blow

Zirc-Ram (Tool 519), used on straight or angle fittings quickly blows out all hardened matter, unless bushing has been completely turned to close the opening. Often the action will reseat damaged fittings. Company points out that one hammer blow on the end of the tool generates up to 1000 lb hydraulic pressure but will not harm fittings as pressure is exerted by oil not metal. Owatonna Tool Co.

For details, circle 69 on Post Card

SOLUBLE OIL reduces metal working heat

Mastercut is an oil base water soluble oil reported to virtually eliminate heat caused by shock and stress in metal working operations. Greater feeds and speeds can be obtained, and tools can be used for longer periods of time. With Mastercut, company says, tools will never reach a temperature over 110 F. Grinding to exact size (2 micro finish) can be obtained, it is stated, without heat cracks or loading of wheels. S & S Engineering Co.

For details, circle 70 on Post Card

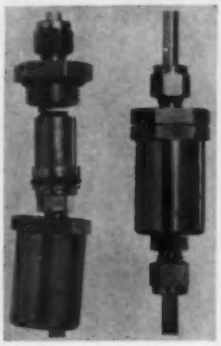
TREATMENT COMPOUND lowers glass maintenance costs

GTC-59 may be used on plastic, enamel, chrome, stainless steel and other smooth surfaces as well as glass. It cleanses and degreases, leaves a clear, lustrous, water-repellent and protective surface, cancels static fields which attract dirt, and has anti-fogging properties. Beaver Laboratories Inc.

For details, circle 71 on Post Card

INLINE FILTER with removable element

For use on instrument air, fluid control and coolant systems, and other applications, the Nupro Filter permits removal and replacement of the filter



element without removing the filter housing. Its large filtering area minimizes pressure drop and increases element life. Elements are 316 sintered stainless steel to prevent flaking and eliminate downstream contamination. Various micron-sized elements can be supplied. The unit comes in brass and 316 stainless steel with Buna N or Vitron A 0-rings and Swagelok tube connections. Nuclear Products Co.

For details, circle 72 on Post Card

CONTROL

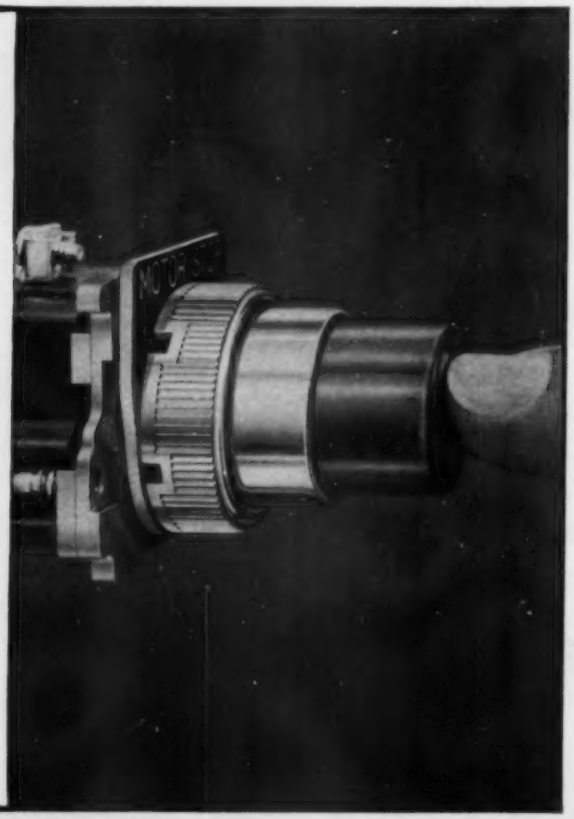
New! Versatile Cutler-Hammer oiltight pushbuttons let you make any station you want

The new interchangeability built into these operators lets you create the station you want from a complete selection of Cutler-Hammer pushbuttons. Get them in one hole or base mounting, 6 bright colors. Thirty different circuit arrangements can be made in hundreds of varieties of stations in standard arrangements of up to 25 elements. Get up to 8 circuits on one pushbutton. They take 40% less back-panel space than next smallest unit so you get more control in less space. Get facts in PUB. LO-104-U274.

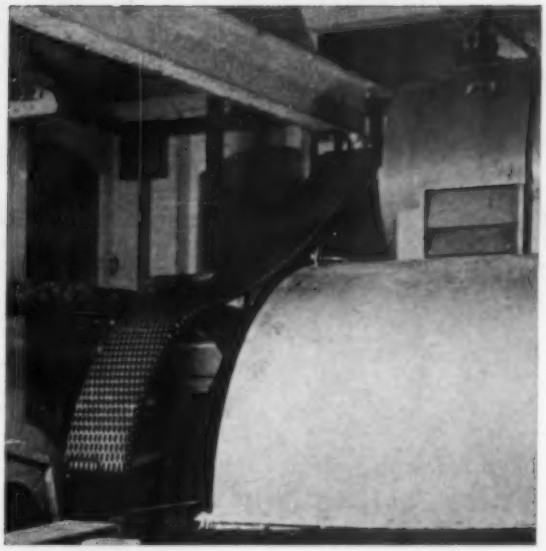
WHAT'S NEW? ASK...

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S.A.



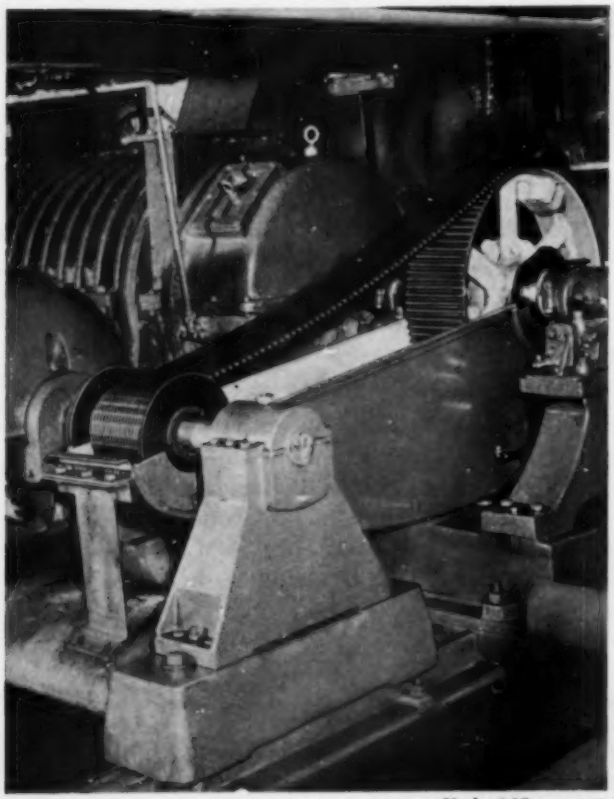
Circle 644 on postcard, page 33



WHERE MINIMUM MAINTENANCE AND MAXIMUM DEPENDABILITY are required of a drive, Link-Belt silent chain drives are unexcelled for light or heavy load applications. Slipless transmission of power to this pulp beater results in a high quality pulp of uniform consistency and in less time than with other types of drives.

Link-Belt silent chain

for drives that can't afford to slip



Smooth, positive engagement assures full power transmission

Continuous, nonslip operation for many years with only routine attention—this is a common experience with Link-Belt silent chain. Where other types of drives are impractical due to slipping tendencies, this modern chain drive delivers positive transmission of full-rated horsepower.

Link-Belt silent chain assures efficiency for either large or fractional-horsepower drives. Easy assembly in tight spaces permits built-in drives, compact housings. Close grouping of equipment saves valuable floor space. High humidity, temperature have no effect on performance. Ratios as high as 10-to-1 are accommodated on relatively short centers.

Available in a full range of sizes. For complete information, call your nearby Link-Belt office or authorized stock-carrying distributor. Ask for Book 2425.

WHERE SPACE IS LIMITED, compact Link-Belt silent chain drives permit close grouping of equipment. High ratio reductions are easily accommodated on relatively short centers.

LINK-BELT

15,027

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World.

Circle 645 on postcard, page 33

COMBINES...

Fulflo

Honan-Crane

Delpark

Michiana

IN THE BROADEST LINE OF INDUSTRIAL FILTRATION EQUIPMENT

From Air to Zinc Cyanide — a CFC filter is installed on every type of industrial filtration job. Ranging from a 5 CFM FULFLO air filter to automated DELPARK coolant filters for central systems handling hundreds of pounds of sludge every hour, CFC equipment is used for every filtration operation — for air, oils, coolants and chemicals.

CFC filters are the choice of industry because they have been proven under diverse and critical operating conditions . . . because CFC has 25 years of design engineering experience in every type of filtration . . . because, from over 4311 standard models and media, plant and design engineers can be sure they will get the best filter available, at the lowest cost. Dept. PE

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

Circle 646 on postcard, page 33

INDUSTRIAL FILMS

Fire-Safe Acoustical Tile

A 16MM sound motion picture introducing a new concept in fire-safe acoustical tile ceilings for commercial, institutional and industrial buildings, is currently available on a free-loan basis for group showings throughout the country.

The film explains how it is possible to achieve rated fire protection for steel supporting members or metal decks by using a new prefabricated acoustical tile ceiling called Armstrong Acoustical Fire Guard. The new ceiling not only sound-conditions,

but also serves as an efficient fire barrier, requiring no additional fire protection above the ceiling.

Also included in the film is a report on recent Underwriters' Laboratories tests which were conducted on the new ceiling to determine its fire-resistant capabilities.

The film, which requires approximately 18 minutes running time, may be obtained for showings by writing to the Armstrong Cork Company, Department I. S., Lancaster, Pa.

Training Film for Arc-Welders

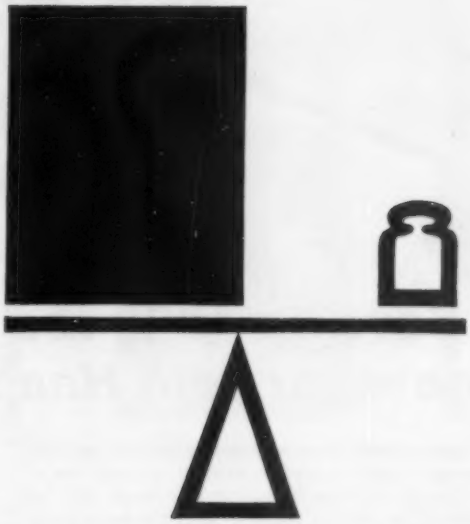
A 16MM FILM in full color and sound on shielded arc-welding procedures, titled "Fundamentals of Manual Shielded Arc-Welding Techniques," is now available.

Adapted from General Electric Company's previously released six-film series, "Inside Arc-Welding," the Airco film has been edited to two reels and is 45-minutes in length.

Part one covers flat and horizontal arc-welding techniques and is 22-minutes in duration. The 23-minute second reel studies vertical and overhead arc-welding procedures. Extremely clear camera closeups of the welding arc in actual operation are featured in the film.

Since operator training is the pri-

Westinghouse dry-type transformers
smallest, lightest
you can buy



Westinghouse dry-type transformers are the smallest, lightest and most versatile on the commercial market today. Easy handling and quick positioning mean low-cost installation.

You can mount Westinghouse Type EP transformers in any position—floor, wall or ceiling. Capsulated construction supports core and coils without bracing or ventilating ducts. Three-phase Type EPT is equally compact. Types DS-3 and DT-3 transformers are especially designed for minimum-space installation on floor, platform or trapeze mountings.

One source can meet all your dry-type transformer requirements. Call your Westinghouse representative—or write Westinghouse Electric Corporation, Pittsburgh 30, Pa. J-70976

You can be sure . . . if it's **Westinghouse**

Circle 647 on postcard, page 33

Read this... Order this... Install this...

Save up to ⅓ the cost of your next conveyor with Handidrive components

Why pay big premiums for unnecessary custom engineering? Order your next conveyor mail order style . . . right out of STANDARD CONVEYOR'S new *Handidrive* Handbook. Get fast delivery right off the shelf . . . save up to ⅓ the usual cost.

How? Using this valuable new Handbook, you can plan your own installation, order the components you need from factory stock, and then assemble them yourself with simple tools to save on erection costs. And, should you need help, our conveyor specialist in your city will be happy to give free advice on layout, ordering, prices and installation.

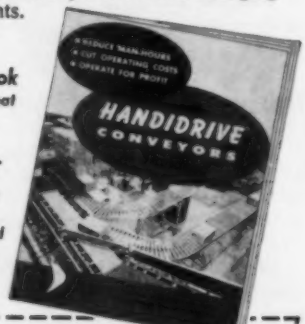
In-stock *Handidrive* components include gravity and power roller sections, belt sections, drive units, curves, supports, hangers, tapered sections, guardrails, feed sections, diverters —everything you normally need for an efficient, low-cost conveyor installation.

Moreover, all components are interchangeable to simplify future alteration of your *Handidrive* system to meet changing material handling requirements.

Check these Standard-ized Handidrive "right-off-the-shelf" benefits

- Lower initial cost . . . you buy only what you need!
- Inexpensive to alter or add to.
- Stock items cost us less to build . . . cost you less to buy!
- The most complete line of fully integrated units all from a single source.
- Ready to ship as fast as we can process your order!

Here's the Handbook *that tells you exactly what to do to cut costs with pre-engineered HANDIDRIVE conveyors. Send for your free personal copy now. Just fill in the coupon, attach to your letterhead and mail. Do it today!*



Standard Conveyor COMPANY

Sales and Service in Over 40 Cities
Look in your Yellow Pages under "CONVEYORS"

STANDARD CONVEYOR COMPANY
305-K Second St., North Saint Paul 9, Minn.

Please send me your new HANDIDRIVE Conveyor Handbook.

YOUR NAME_____

YOUR TITLE_____

Circle 648 on postcard, page 33

INDUSTRIAL FILMS

mary purpose of the film, the four basic principles of arc-welding—current setting, speed of travel, length of arc and angle of electrode—are graphically explained. In addition, good and bad examples of arc-welding are examined.

Film prints may be obtained on loan and without charge by contacting the local representative of Air Reduction Sales Company, a division of Air Reduction Company, Inc., listed in the telephone directory.

Tube Installation Techniques

A 20-MINUTE color movie showing some of the hazards encountered in tubing installation and how to avoid them, has been produced by The Imperial Brass Mfg. Co., Chicago. The film demonstrates the correct way of handling tube cutting, flaring and bending operations.

The movie is currently being presented at sales meetings and at Tubemanship Clinics being held by distributors with industrial plants, and trade schools.

One of the purposes of the film is to highlight installation methods that save time and prevent trouble on tubing jobs.

For further information write to E. F. Todd, Sales Promotion Manager, The Imperial Brass Mfg. Co., 6300 W. Howard St., Chicago 31, Ill.

Stepless Speed Control

DESIGN FEATURES and user benefits of Clark's 2000-lb capacity electric-powered fork truck, are illustrated in a new sound and color slide film.

The film, titled "Something New—Something Better," illustrates and explains stepless speed control made possible by a carbon pile resistor. The resistor control unit makes inching operations easy by giving steady increase in tractive power. The film also shows how the electric Clarklift 20 has fast lift speeds, short turning radius requirements and lower operating cost.

"Something New—Something Better" has a viewing time of 20 minutes and is available free for showing to interested groups. To request a copy, write to: Slide Film Department, Industrial Truck Division, Clark Equipment Company, Battle Creek, Mich.

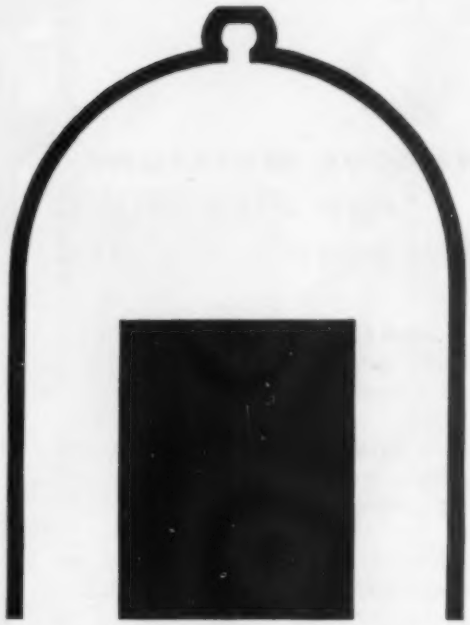
Making Specialty Steels

THE STORY of the science and the art that goes into the making of special purpose steels such as stainless

Westinghouse dry-type transformers

guaranteed

super-quiet



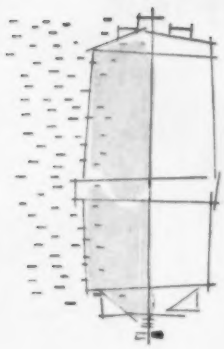
Quiet operation is a certainty in dry-type transformers built by Westinghouse — the only manufacturer that tests each unit in a special sound room before shipment. Guaranteed quietness and exceptional compactness enable designers to place transformers for maximum convenience and efficiency.

You can mount Westinghouse Type EP transformers in any position — floor, wall or ceiling. Capsulated construction supports core and coils without bracing or ventilating ducts. Three-phase Type EPT is equally compact. Types DS-3 and DT-3 transformers are especially designed for minimum-space installation on floor, platform or trapeze mountings.

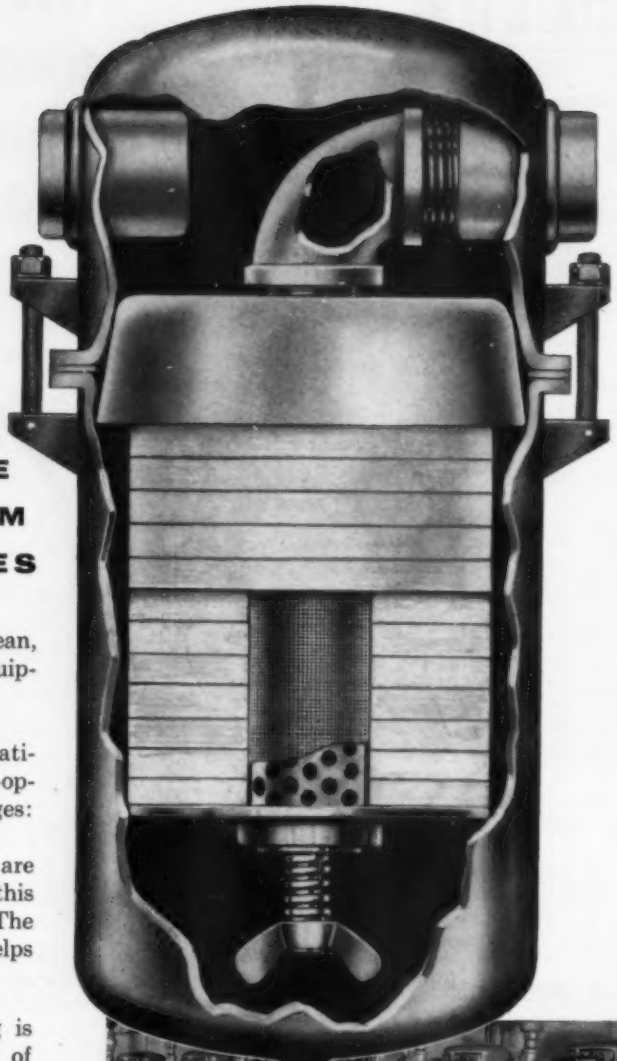
One source can meet all your dry-type transformer requirements. Call your Westinghouse representative — or write Westinghouse Electric Corporation, Pittsburgh 30, Pa. J-70971

You can be sure . . . if it's **Westinghouse**

Circle 649 on postcard, page 33



DOLLINGER
DRY FILTER
SPECIALISTS
FOR
40 YEARS



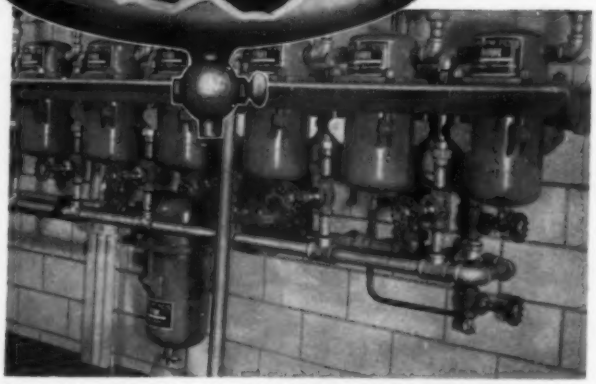
REMOVE MOISTURE AND DIRT FROM COMPRESSED AIR LINES

Dollinger Staynew Filters keep air dry and clean, assure smooth operation of mechanical equipment despite constant change in humidity.

Model AAPHS Staynew Filters protect pneumatically-operated controls, instruments and air-operated tools. They offer a variety of advantages:

- Low resistance—heavier dirt particles are eliminated before the air itself is filtered; this prevents clogging of the filtering element. The result is low resistance to flow; this helps maintain line pressures, saves horsepower.
- Continuous operation—frequent cleaning is eliminated because of a liberal amount of space in the housing for accumulated dirt and condensate; this can be drained without shutting down the line.
- Accessibility—interior parts are easily exposed for inspection and cleaning. Loosening of swing bolts permits removal of lower housing without breaking pipe connection.

For positive, trouble-free filtration, specify Dollinger. Call our representative nearest you, or write for Bulletin 200. Dollinger Corporation, Industrial Products Division, **55** Centre Park, Rochester 3, New York.



Part of an installation of 18 Staynew Filters protecting air-operated instruments in a power plant. Model AAPHS Filters operate effectively at pressures as high as 125 lbs. gauge.

PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Circle 650 on postcard, page 33

steels and tough wear- and shock-resistant steels for the tool room, is told in a 45-minute long color film, "Specialty Steels."

The sequence on stainless steel was photographed at Crucible Steel Co.'s mill at Midland, Pa. and the tool steels sequence was made at the Sanderson-Halcomb Works, Syracuse, N. Y.

In making the film, the camera crew worked in steel helmet, goggles and gas masks and, protected by portable asbestos shields, often pushed close to the electric melting furnaces. Because of the intense heat during the shooting of such scenes, exposed and unexposed film was stored in a portable refrigerator.

For further information about this film, write to Crucible Steel Company of America, Pittsburgh 22, Pa.

Versatility of Conveyors

"IT'S YOUR MOVE" is a color motion picture which dramatizes the principle of continuous flow in materials handling with a wide variety of examples, from bulk handling of coal and gravel to automated processes in manufacturing.

This 16-mm film released by the Conveyor Equipment Manufacturers Association has a viewing time of 24-minutes.

For free film loan, write to Modern Talking Pictures Service, Inc., 3 East 54th Street, New York 22, N. Y.

Curtain Wall Construction

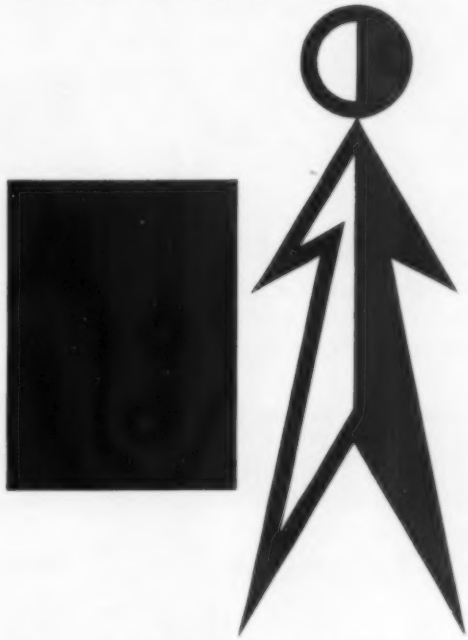
A HOW-TO-DO-IT study of the techniques employed in curtain wall construction is the theme of a new motion picture titled "Casting and Erecting Concrete Curtain Walls."

The 16 mm sound-and-color film deals with the numerous methods used to cast and put in place decorative wall panels, and treats such subjects as rubber and plastic form liners, plaster of Paris forms, sandwich panels, grille wall units, sand molds and exposed aggregate techniques. Methods used to attach concrete curtain wall panels to building frames are illustrated.

"Casting and Erecting Concrete Curtain Walls," is intended for showing to contractors, engineers, architects and other interested groups. Sixteen millimeter sound and color prints are available on loan from the Portland Cement Association's 35 district offices located in major cities of the United States, including Hawaii, and in Vancouver, British Columbia.

Westinghouse dry-type transformers

cut labor costs with factory-mounted circuit breakers



When you specify pre-mounted circuit breakers on Westinghouse dry-type transformers, the unit is delivered with the breaker completely wired to the transformer primary. No further connections are necessary. You save hours of labor, eliminate cable and conduit fittings.

You can mount Westinghouse Type EP transformers in any position — floor, wall or ceiling. Capsulated construction supports core and coils without bracing or ventilating ducts. Three-phase Type EPT is equally compact. Types DS-3 and DT-3 transformers are especially designed for minimum-space installation on floor, platform or trapeze mountings.

One source can meet all your dry-type transformer requirements. Call your Westinghouse representative — or write Westinghouse Electric Corporation, Pittsburgh 30, Pa. J-70972

You can be sure . . . if it's Westinghouse

Circle 651 on postcard, page 33

Filter Media

(Continued from page 135)

and coke, also in flour and grain milling, in cement and ceramic plants.

A big advantage of woven wire screen lies in the fact that it can be convoluted very closely. Therefore, a large filtering surface can be provided in a comparatively small area.

Glass Fiber Filter Media

Glass fibers in either the woven or non-woven form are used for filter media. They are desirable where freedom from corrosion and temperature resistance up to 800 F are requirements. Their range of pore sizes is from 5 microns (matted) to 100 microns.

Glass fabric is sometimes used in bag-type dust collectors and has raised operating temperature limits to about 600 F, which is considerably higher than that of natural and synthetic fibers.

Low flexural strength is the chief disadvantage of glass fibers. Therefore, in removing dust from glass fiber dust collectors, the bags must not be subjected to shaking methods that will break the fibers.

Filter Elements for Original Equipment

A special field in filtration is where manufacturers will incorporate filters as integral parts of their products or equipment. These are custom-made in many different sizes and shapes, including flat, disc, cylindrical, deep drawn, conical and irregular contours.

They are made of all metals such as chrome nickel steel, bronze, copper, brass, aluminum and Monel; also in all plastics such as polystyrene, polyamide, polyethylene, polyvinyl chloride, and polycarbonate.

These filter elements are made in all weaves and gauzes—plain, twill and twill lace—from the coarsest to the finest.

What is the Best Filter Medium?

The *best* filter medium is the one that does the most efficient job of filtering at the lowest cost. But naming the specific medium for a particular application is not so easy. Many requirements must be fulfilled. There are so many types of filter media from which to choose. New media are frequently being developed. Sometimes a medium which is used effectively in one industry can be used with equally successful results in other industries. Therefore, the best way to find the *right* filter medium for your job is to call upon an engineer who specializes in filter media. His broad experience should prove to be most helpful to you. **End**

Ruggedly Built

—AND THOROUGHLY PROVED BY YEARS OF HARD EVERYDAY USE IN THOUSANDS OF PLANTS

HANSEN

ONE-WAY SHUT-OFF

QUICK-CONNECTIVE

PUSH-TITE COUPLING

Here's the fluid line coupling that can really take it. The ability of Hansen Push-Tite Couplings to withstand severe service—with practically no maintenance—has been thoroughly proved by years of hard, everyday use in thousands of plants.

To connect a Hansen Push-Tite Coupling, you merely push the Plug into the Socket—as easily as plugging in your electric shaver. Flow is automatic—instantaneous. Plug swivels freely—no kinking of hose. To disconnect, pull back sleeve on Socket. Instantly and automatically, Socket shuts off flow of air or liquid.

Leak-Proof, Minimum Wear Locking Device

Locking pins in Socket afford uniform large area contact with Plug—thereby preventing wear and subsequent leakage. The socket head, containing locking device, is factory assembled into a rugged integral unit which cannot be readily injured or have component parts lost by casual tampering.

QUICK
CONNECTION AND DISCONNECTION
INSTANT
AUTOMATIC FLOW OR SHUT-OFF

Write for the HANSEN Catalog

Here is an always ready reference when you want information on fluid line couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight Through Couplings.

Representatives in Principal Cities ... See Yellow Pages

SINCE 1913 QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 35, OHIO

Circle 652 on postcard, page 33

Construction Briefs

This series of articles is available in booklet form.

Booklet No. 1 covers beam reactions, bending moment, moment of inertia and section modulus; No. 2—deflection, horizontal shear and floor loading; No. 3—columns, trusses and welded connections; No. 4—fastening for timber, design of trussed roof and structural design; No. 5—designing in reinforced concrete; and No. 6—design of concrete columns, footings and retaining walls.

Booklets No. 1 through 4 are available at 50 cents each; Booklets 5 and 6 are 75 cents each; or the complete set of six booklets for $3.50. Send your request to the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois.

ADVANCED FERRO-PHOBIA

*No Couch Can cure it, but **Dings**'ll do it.*

. . . Fer'ro-pho'bia. Fear of iron. It's enough to send cost-conscious "Supers" into a sweat and Treasurers into a trauma.

Head shrinking may tranquilize the symptoms but does little to remedy costly repairs, production delays and ruined product caused by tramp iron in the "works."

Dings has the Rx for tramp iron psychosis —of *all* types. There's a Dings electric or non/electric unit for installation in, on or above *any* processing or materials handling system. And there are Dings units which can save you money and time in: product purification, metallic reclamation and the beneficiation and concentration of a wide range of substances.

See your Dings man, or write for Bulletin C-5000-B.

Dings

DINGS MAGNETIC SEPARATOR COMPANY

4766 West Electric Avenue, Milwaukee 46, Wis.

MAGNETIC SEPARATION

Stop tramp iron damage before it costs you money
LET DINGS DO IT.

***Here's just one way*—Dings magnetic pulleys, electro or permanent, are at work pulling unwanted iron out of everything from grain to cotton . . . to chemicals and molybdenum ore.**

For over sixty years—Industry's Specialists for magnetic: separation . . . concentration . . . materials handling

Circle 653 on postcard, page 33

PE-281

No. 11 in a series of washroom survey comments from "SBS soap counselors"

We showed them how to end Soap Waste permanently!

James B. Workman

SBS Soap Counselor on the Eastern Seaboard, has helped many plants update their wash-up practices. Here's his report after surveying a electrical equipment manufacturing plant:

"We observed the usual powdered soap waste in 23 of the 26 washrooms surveyed. Soap scattered about made an unsightly mess of the washbasins, made the floors dangerously slippery and made cleaning-up twice the job it should have been. You could see the plant's hygiene dollars — both manpower and materials — literally disappearing down the drains!

"To correct this problem, we recommended SBS 60, a thick-bodied cream that clings to skin, won't run-off hands or faces like a powdered soap and is almost impossible to waste. They were convinced when we told them that based upon our experience in other plants, a single gallon of SBS 60 will give their employees 2400 economical, waste-free washes!"

Money-saving suggestions like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J.
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

Circle 654 on postcard, page 33

NEW BOOKS

for the plant engineer

On Digital Computer Logic

COMPUTER LOGIC by Ivan Flores. Size 9¼ x 6¼ in. approx; 458 pp including index; 1960 edition; illustrated: clothbound. Published by Prentice-Hall, Inc., Englewood Cliffs, N. J. Price $12.00.

A FUND of knowledge on a timely and fascinating subject is contained in this book. The general tenor of the contents should make it of some value even to those with a limited scientific background. For a more thorough appreciation of the material a good knowledge of engineering, particularly electrical, and mathematics is, of course, advantageous.

The introductory chapter includes brief accounts on the working of a computer, what it can do, and for what jobs it is used. It also has short comparisons between analog and digital types.

First principles are presented in the ensuing chapter with a good bit of terminology being introduced. Among the items treated in this section are the means of instructing the computer and data structure.

Some of the topics of the following 13 chapters are: the flow and control of information; machine languages; logical construction; functional units; memory devices and their logic; and input and output equipment.

In the last chapter the application of various steps leading to the solution of a sample problem is presented.

The book also contains an extensive glossary of terms relating to computers.

On Insulation Thicknesses

HOW TO DETERMINE ECONOMIC THICKNESS OF INSULATION. Size about 11 by 9½ in.; over 170 pp; paper covers with plastic page retainer. Available from the National Insulation Manufacturers Association, 441 Lexington Avenue, New York 17, N.Y. Price $8.00.

THE ORIGINAL manual on economic thickness of insulation was prepared by the Union Carbide Chemicals Company and West Virginia University. It was planned for bringing about savings in Union Carbide plants. The new expanded edition, through the courtesy of Union Carbide Corporation, is now available for general use.

Materials contained in this book represent a lot of work. With the aid of

"The one you recommended handled the problem."

No doubt your problem is different from the ventilation "hot spot" above. But if it can be solved electrically, your Graybar man is *interested* . . . qualified to *help* . . . and has the *right product* to match the need.

With a catalog of 100,000 electrical items, how can he miss?

For an impartial recommendation, call Graybar first. We'll work with you or your electrical contractor. 94

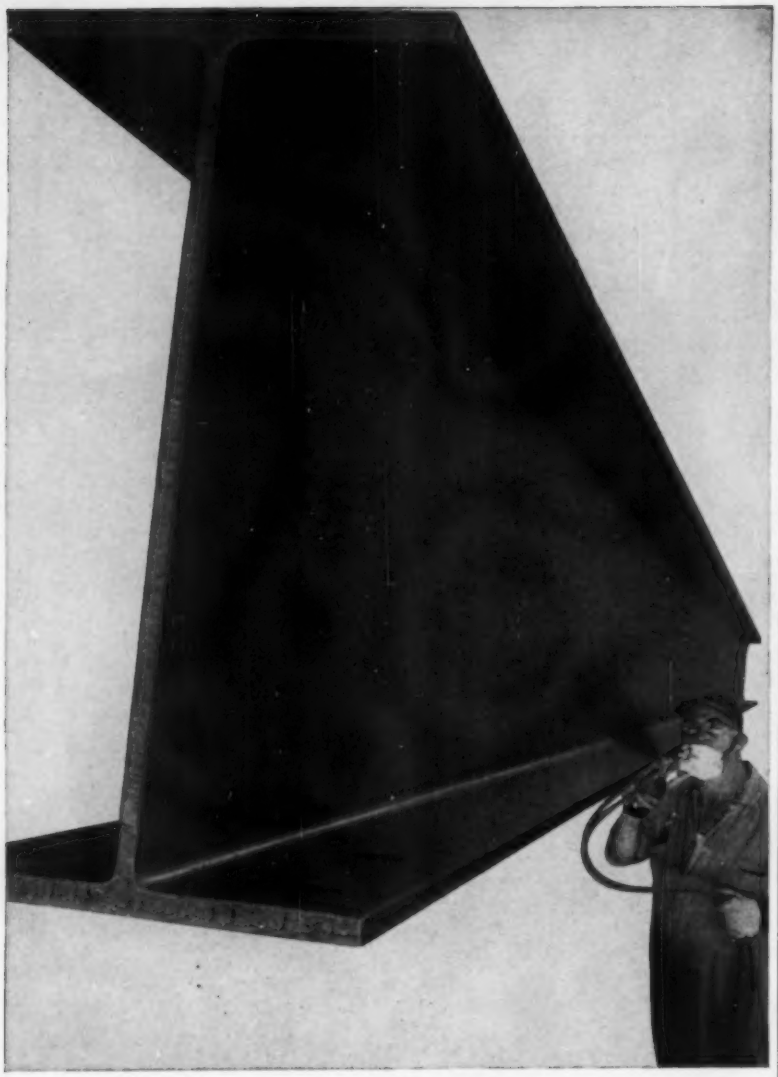
GraybaR

ELECTRIC COMPANY, INC.

Everything Electrical GraybaR Electric Company

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • OFFICES IN OVER 130 PRINCIPAL CITIES

Circle 655 on postcard, page 33



All the advantages of hot-dip galvanizing PLUS job-site application with CARBO ZINC 11

INORGANIC ZINC COATING is rapidly gaining recognition as the ultimate for basic protection of steel. For example, a large Gulf area chemical plant now under construction specified zinc—both hot-dip galvanizing and Carbo Zinc 11 inorganic zinc coating. Both methods are equal in performance and galvanic protection—the choice is a matter of economics.

HOT-DIP GALVANIZING is generally best for small pieces and irregular shapes: handrails, angles, floor gratings, ladders, etc.

CARBO ZINC 11 is best where these exclusive advantages count:

- Application can be made on the job-site.
- Old steel, in place, can be galvanically protected.
- Repairs can be made in the field.
- Field welding can be touched up.
- Only one side need be coated, such as storage tanks.
- All sizes and shapes can be coated.

EASY TO APPLY with spray or brush in any kind of weather. Water insoluble in 20 minutes.
WRITE for analysis of costs "When to Hot-Dip Galvanize—and When to Use Carbo Zinc 11."

Maintenance Coatings with Experience... **carboline COMPANY**

6110

32-T Hanley Industrial Ct. • St. Louis 17, Mo.

Circle 656 on postcard, page 33

NEW BOOKS

the electronic computer various cost factors were processed and reduced to tables and charts—helpful tools for specifying economic thicknesses of pipe and flat surface insulation.

The manual has a report on an actual installation in which the improper choice of insulation (1½ in.) was costing the user $0.18 per foot of pipe per year more than it would cost for proper thickness of 2½ in.

The capital investment charts have been extended in this new edition covering steam costs from $2 per pound of steam per hour to $24.

Structural Design

PRACTICAL DESIGN OF STRUCTURAL MEMBERS by Thomas A. Lucy. Second edition; size 10¾ by 7¼ in. approx; 432 pp; cloth bound. Published by F. W. Dodge Corporation (a McGraw-Hill Co.) 119 West 40th St., New York 18, N.Y. Price $12.00.

A PRACTICAL MANUAL with time-saving features for engineers whose responsibilities entail design of structural work. Charted material, diagrams and discussions found in this book are aids for streamlining engineering operations.

Among the items with which the book deals are: reinforced concrete beams and slabs; foundations and footings; retaining walls; steel plate girders; roof trusses; wind stresses; wood; earthquake resistance; and rigid frames.

Industrial Management

MANAGEMENT GUIDES by B. T. Lewis and Wm. W. Pearson; size 8½ by 6½ in.; paperbound, Published by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11, N.Y.

Management Guide for Work Simplification—No. 275-5; 71 pp; price $1.50. This fifth in a series of books can be considered a familiarization treatment of the topic of work simplification, with suggestive information for the improvement of efficiency. The material in this publication includes comments on flow process charts, the man-machine chart, waste of time, and attacking and locating waste.

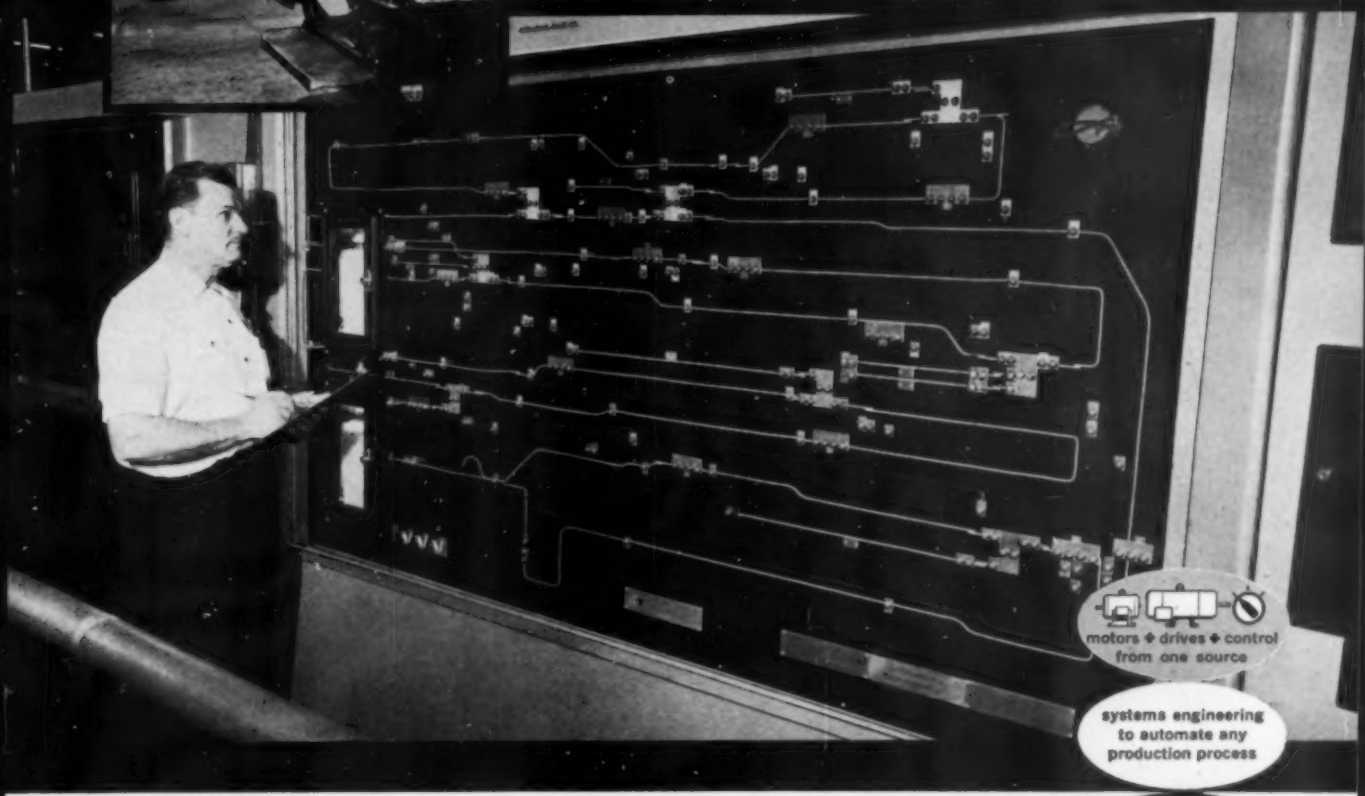
Management Guide to Human Relations in Industry—No. 275-6; 58 pp; price $1.25. Good human relations in industry result from not merely the application of principles to the plant

Circle 657 on postcard, page 33 ➔

FROM INITIAL BODY ASSEMBLY—Louis Allis controllers coordinate the intricate assembly of sidegate framing fixtures and underbody just prior to welding by synchronizing the arrival of three components from three different locations at precisely the same time . . .

TO PRE-FINAL ASSEMBLY AREA—where a bank of Louis Allis controllers regulate the drives powering the mating line where unitized body, stub-frame / engine assembly and running gear are assembled into units like the Plymouth convertible shown coming off the assembly line . . .

AND 3-DIMENSIONAL AREA CONTROL CENTER — which monitors conveyor operations. Any type of production interruption is quickly revealed and identified by signal light indication. Recorders provide a permanent daily record of each conveyor's operation.



motors ◆ drives ◆ control from one source

systems engineering to automate any production process

LOUIS ALLIS engineered systems automate Chrysler assembly lines

An automobile assembly line is a materials handling complex of movement and synchronization. Feeder lines joining the main-line must deliver components on time — and in perfect synchronism. Still, the system must be flexible enough to accommodate speed changes when desired.

The Plymouth assembly plants in Detroit and St. Louis are models of this type of automation . . . and electrical components for the materials handling systems were custom-engineered by Louis Allis. L. A. systems engineers worked with Plymouth engineers to map the flow sequence. Louis Allis provided the adjustable speed drives and precision controls to operate the systems and supervised the installation. The result: integrated, automated systems that eliminate time loss, manpower waste, and excess materials handling costs.

Synchronized conveyors operate at pre-set speeds by following built-in master job-rate controllers. The system provides for automatic, position-perfect transfer of body components from one conveyor to another. A three-dimensional area control center monitors and records all conveyor operations.

If your plans call for automation, contact Louis Allis for systems engineering assistance — and single-source responsibility of drive and control design, manufacturing, and service. Call the Louis Allis District Office nearest you, or write to The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin. Ask for Bulletin 2900.

LOUIS ALLIS

ASD-339

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

Grinding operation, dust control piping overhead.

No two dust control problems are alike!

Grinding operation, dust control "down draft" under floor.

Since no two dust control problems are alike, a Kirk and Blum engineering survey determines the exact nature of *your* specific application. It's all part of K & B's *complete* service to assure you the best system for your particular need, all factors considered.

From survey time until the system is completed and in operation, Kirk & Blum handles the entire job with one undivided responsibility . . . a condition only possible when you have *one* source for all service, *one* guarantee for all components.

Write today for the new 52-page K & B Catalog or a no-obligation survey of your particular problem. The Kirk & Blum Mfg. Co., 3189 Forrer St., Cincinnati, 9, Ohio.

KIRK & BLUM *Complete Dust Control Systems*

Circle 658 on postcard, page 33

NEW BOOKS

people in general but participation of management. Individuals in the management category should approach the treatment of workers under them with at least some knowledge and appreciation of various factors which lead to good human relations. Volume 6 of the series presents some insight into this important field. Among the topics it treats of are: organization and executive planning; the line supervisor; motivation and human relations; and leadership and human relations.

Management Guide for Maintenance Cost Reduction—No. 275-7; price $1.50. Volume 7 is a manual outlining proven methods relating to cost reduction in maintenance operations. The book can be used not only as a reference text but also for teaching purposes. The following are among the topics discussed in this volume: locating areas for maintenance cost reduction; organizing for maintenance cost reduction; the flow process chart; and supervision and training in maintenance cost reduction.

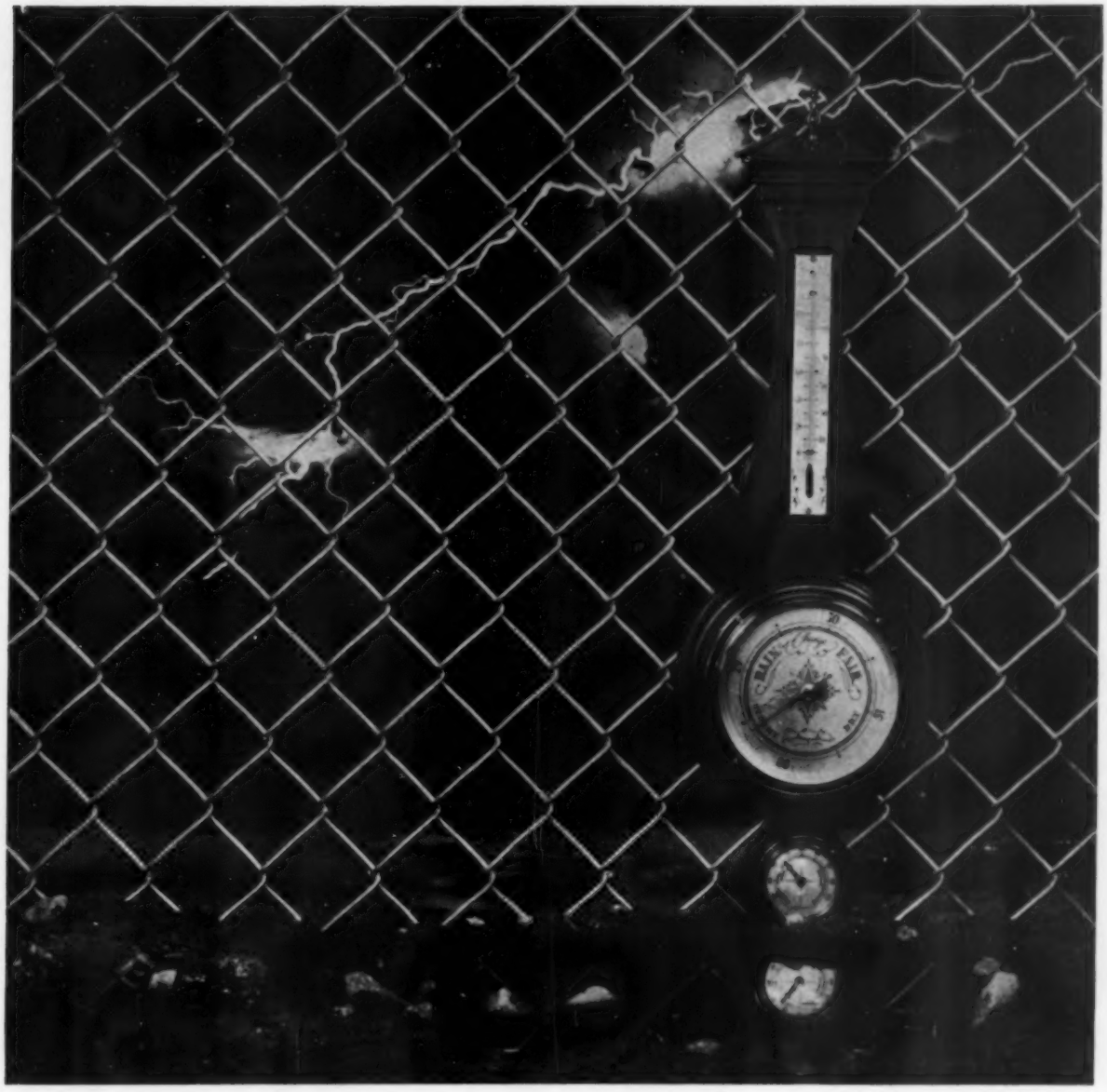
Water Treatment

WATER TREATMENT FOR INDUSTRIAL AND OTHER USES by Eskel Nordell. Second edition; size 9¼ by 6⅜ in.; over 600 pp including index; illustrated; clothbound. Published by Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N.Y. Price $12.00.

REQUIREMENTS of industry, municipalities and other users call for vast quantities of water daily. It follows that treatment is extensive and varied, and many people are concerned with water conditioning. Among these individuals are those especially interested in the practical aspect of water technology. Here's a book that contains a good bit of material for them and others on many facets of water treatment.

Of the chapter topics treated in this book, here are some: turbidity, sediment, color, organic matter, tastes, odors, and micro-organisms; boiler feedwaters; deaeration; sodium cation-exchange (zeolite) water-softening process; ion-exchange demineralization processes and distillation, and hot water softening processes.

The appendix section contains some curves and many tables. The latter present such information as: volume equivalents; calcium carbonate conversion factors; hydrochloric acid conversion tables; chemical formulas; formula weights, and equivalent weights; and water pressure conversions.



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AVAILABLE from Advertisers

Guide to literature offered this month in ads received by PLANT ENGINEERING before the first of last month

MECHANICAL POWER TRANSMISSION

No-Slip Drives—Book 2425 describes silent chain drives. Link Belt Co.
Circle 201 on Post Card

Drive Tensioners—Facts on low cost tensioner for single, multiple width drives. Brewer Machine & Gear Co.
Circle 202 on Post Card

For Power Transmission—Bulletins on Dyna-V drives, chain and sprockets, rolling bearings. Dodge Mfg. Corp.
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Job-Proved Chain—Details on chain that operates with peak efficiency. Atlas Chain & Mfg. Co.
Circle 204 on Post Card

High Capacity V-Belts—Information on space-saving Super HC drive. The Gates Rubber Co.
Circle 205 on Post Card

Capable Coupling—Catalog describes coupling to handle misalignment. Ajax Flexible Coupling Co., Inc.
Circle 206 on Post Card

LIGHTING

For Better Lighting—"Guide to Modernization and Relighting" gives pointers. Day-Brite Lighting, Inc.
Circle 207 on Post Card

Fluorescent Starter Ideas—Selection chart and maintenance guide for fluorescent light. General Electric Co.
Circle 208 on Post Card

VALVES, TRAPS, PIPING, FITTINGS

Butterfly Valves—Bulletin 590X describes advantages of these resilient seated valves. W. S. Rockwell Co.
Circle 209 on Post Card

Ball Valves—Brochure ADB 1001 describes valves built for superior flow control, less upkeep. Crane Co.
Circle 210 on Post Card

Positive-Sealing Ball Valve—Facts on Con-O-Sphere valve with teflon and ball capsule for maximum seal, on-flow adjustment. ACF Industries.
Circle 211 on Post Card

Pinch Valves, Systems—Masseo-Grigsby pinch valves are in Catalog 609. Mine and Smelter Supply Co.
Circle 212 on Post Card

Top Value in Valves—Folder 189-B describes bronze globe, angle and check valves. Jenkins Bros.
Circle 213 on Post Card

Efficient Thermostatic Traps—Bulletin 257 tells features of Quik-Flex steam traps. The V. D. Anderson Co.
Circle 214 on Post Card

Nonfreezing Trap—Bulletin T1743 tells advantages of Yarway Impulse steam trap. Yarnall-Waring Co.
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Chemical-Resistant Pipe—Plastic Pipe Fact-pak gives practical product information. Carlon Products Corp.
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Durable Swivel Joints—Catalog describes full line. Chiksan Co.
Circle 219 on Post Card

LUBRICATION

Efficient Machine Lubrication—Grease, fluid-type lubricants detailed in "Lubriplate Data Book." Fiske Brothers Refining Co.
Circle 220 on Post Card

Lubrication by Experts—Facts on lubrication-engineer service for solving lube problems. Sinclair.
Circle 221 on Post Card

FANS, VENTILATING

Ready-to-Run Fans—Information on self-contained, packaged units. Clarage Fan Co.
Circle 222 on Post Card

Ventilation Guidebook—Bulletin 1522 helps plan plant ventilation. Ilg Electric Ventilating Co.
Circle 223 on Post Card

Easy-To-Maintain Ventilator—Bulletin DR-7-61 describes Power Flow roof ventilator. De Bothezat Fan Div.
Circle 224 on Post Card

Weatherproof Ventilator—Bulletin 680-PE describes Sky-Blast ventilator. Robbins & Myers, Inc.
Circle 225 on Post Card

Roof Ventilator—Details on efficient fan. Hartzell Propeller Fan Co.
Circle 226 on Post Card

HEATERS, HEATING

Unit Heater Replacement—Details of plan that eliminates downtime, avoids costly repairs. Modine Mfg. Co.
Circle 227 on Post Card

Direct Gas-Fired Heaters—Handbook "Industrial Applications of Direct Gas-Fired Heaters." Reznor Mfg. Co.
Circle 228 on Post Card

TOOLS, MACHINE SHOP

Time-Saving Tools—Catalog shows saws, tools and accessories. Porter-Cable Machine Co.
Circle 229 on Post Card

For Skilled Hands—Facts on quality tools. The Ridge Tool Co.
Circle 230 on Post Card

Save Costly Re-Grouting—Details on why Embeco is best for machine support. The Master Builders Co.
Circle 231 on Post Card

DUST CONTROL

Safe, Easy Dust Control—Catalog 155B tells how to handle tough dust control jobs safely. The Spencer Turbine Co.
Circle 232 on Post Card

For Efficient Dust Collection—Information on solving dust collection problems efficiently. Buell Engineering Co., Inc.
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Dust Collection Simplified—Brochure on Dustkop collectors. Aget Mfg. Co.
Circle 234 on Post Card

MAINTENANCE

Weatherproof Plant Protection—Booklets on painting with aluminum and features of aluminum roof coatings. Alcoa.
Circle 235 on Post Card

Color Survey Service—"Quick Reference Guide" plus "How to Reduce Painting Costs". Barreled Sunlight Paint Co.
Circle 236 on Post Card

Heat-Proof Coating—Information and sample of coating that stands the torch test. Markal Co.
Circle 237 on Post Card

Inorganic Zinc Coating—Cost analysis on when to use Carbo Zinc 11, Carboline Co.
Circle 238 on Post Card

To Stop Rust—Color catalog, sample, and penetration study data of metal coating. Rust-Oleum Corp.
Circle 239 on Post Card

Descale without Dismantling—Booklet describes dry-acid cleaner. E. I. du Pont de Nemours & Co., Inc.
Circle 240 on Post Card

COOLANT

Cool Cuts—Details on cutting oil for accurate, clean operations. Cities Service Oil Co.
Circle 241 on Post Card

Improved Coolant—Details on Amocool. American Oil Co.
Circle 242 on Post Card

Postage-free cards for ordering literature are on pages 33-34.

UNEQUALLED FOR FEATURES AND PERFORMANCE

DRAW-OUT DESIGN LIMITAMP* CONTROL

CONTACTOR IN PLACE

. . . speeds Limitamp control inspection and maintenance

Maintenance is an easy job with General Electric's draw-out Limitamp control. Routine maintenance is quickly performed with the contactor in place.

Coils and contact tips can be changed in minutes. Simply lift out the arc chutes and one arc horn to expose the bolts holding coils and tips in place.

To make your job still easier, a magnet-head wrench is supplied with units. This wrench fits all bolts necessary to change coils and tips. Remember . . . Limitamp control is all front connected.

To replace fuses, you just pull the ejector and the fuses pop up. When a fuse is replaced, it is guided into position by a back-stop on the clip.

Another feature is a special test circuit—built into each control. Bring in external power and connect it to the terminal board. You can then safely operate the panel—automatically isolated from normal power source with the door open—to check out the unit before putting it in service.

Ask your G-E Sales Engineer or Agent about other advanced-design maintenance, installation, operation, and performance features of Limitamp control. Or, write Section 783-25, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

* Reg. Trade-mark of General Electric Company.

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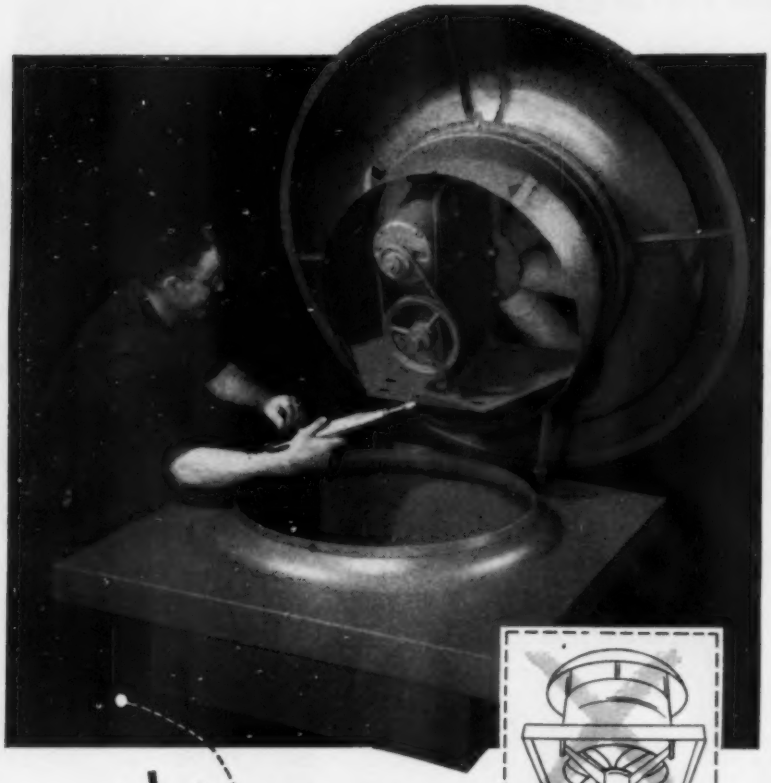
GENERAL ELECTRIC

Circle 660 on postcard, page 33



FLIP-TOP
ROOF VENTILATOR
cuts Maintenance Cost

Entire motor-and-fan housing may be flipped back 90° to make motor, drive assembly and fan conveniently accessible above roof level. Such easy access to all working parts for quick inspection cuts maintenance costs substantially by saving time and making the work easier.

This new DeBothezat "flip-top" Power-Flow roof ventilator offers fan wheels from 12" to 48" in diameter and capacities to 43,070 CFM. A Vertical Discharge Model exhausts dust and oil-laden air at high velocity, to disperse contaminants high enough to prevent their re-entry into building's air supply.

Write for illustrated Bulletin DR-7-61

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Circle 661 on postcard, page 33

CONSTRUCTION

Ready for Erection—Details on expanded metal partitions with Quik erect clips. The Globe Co.

Circle 243 on Post Card

Steel Framing at Less Cost—Idea Booklet suggests how to build with AIM slotted angle. Acme Steel Co.

Circle 244 on Post Card

For Gleaming Walls—Booklet AIA 23G tells features of economical Sanitile. The Master Mechanics Co.

Circle 245 on Post Card

Safety Underfoot—Bulletins describe abrasive and diamond-patterned floor plates. Alan Wood Steel Co.

Circle 246 on Post Card

Thrifty Window Replacement—Details on advantages of plastic and fiber glass panels. Barrett Div., Allied Chemical Corp.

Circle 247 on Post Card

Stop Sun Glare—Colorful folder tells how Sun-X glass tint solves sun problems. American Glass Tinting Corp.

Circle 248 on Post Card

Traffic Doors—Catalog shows Rubbair doors that reduce operation, maintenance problems. Stic-Klip Mfg. Co., Inc.

Circle 249 on Post Card

PACKINGS

Of Nylon Composition—Pumcups for controls, cylinders, pumps are described in Bulletin 5903. Darling Valve & Mfg. Co.

Circle 250 on Post Card

Lattice Braid—Economical Teflon pump packing is described in Bulletin AD-185. Garlock, Inc.

Circle 251 on Post Card

Mechanical Packings—Information on complete stock of packings. The Belmont Packing & Rubber Co.

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MATERIALS HANDLING

Power-Team Hoist—Section Bulletins 86, 87 tell how Hoistractor saves time, reduces fatigue. Gardner-Denver Co.

Circle 253 on Post Card

For Economical Hoisting—Facts on safe wire rope Griphoist that lifts up to 3300 lb. Griphoist, Inc.

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Lifting Made Easy—Facts on overhead traction cranes. Manning, Maxwell & Moore, Inc.

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Sheet Steel Handling—Bulletin SL-30 tells how C-F lifter handles sheet steel easier. Cullen-Friestedt Co.

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Dumping Hopper—Details on a hopper that automatically dumps, rights and locks. Roura Iron Works, Inc.

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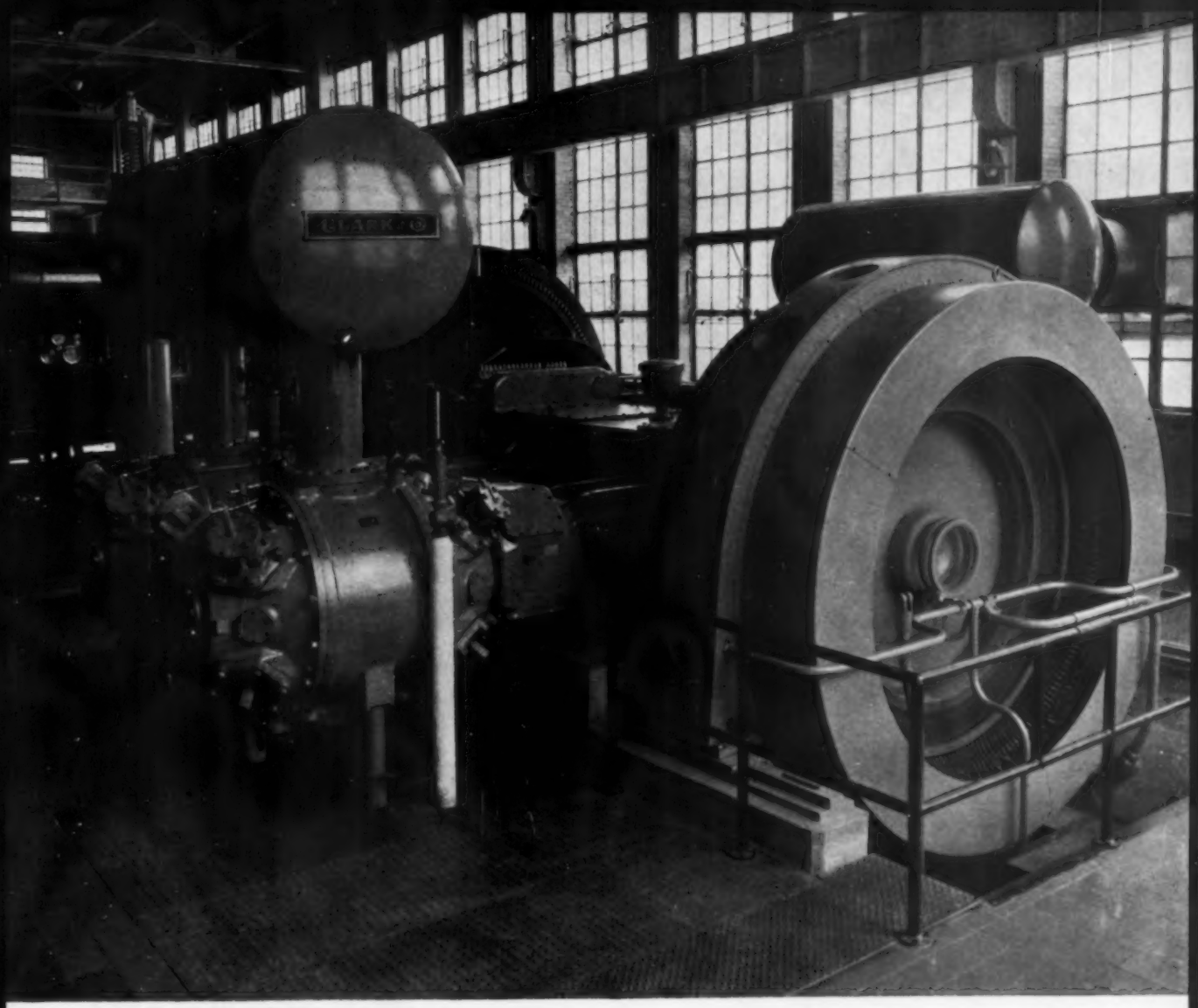

Clark Air Compressor Keeps Lid On Maintenance!

Just Plain Dependable—That's the only way to describe this 2000 bhp Clark CBA-4 Balanced/Opposed Compressor. Ten years ago it was installed in the assembly plant of a major Detroit automotive manufacturer. To date, there has been no forced downtime other than scheduled maintenance overhauls.

On Duty 16 Hours a Day, five days a week, the compressor operates as a base load machine supplying 10,000 cfm of air at 105 psi. This is rated at 8% of total plant air utilized to operate the assembly line, paint shops, glass plant, blast furnaces and other functions.

Under a Preventive Maintenance Program, the compressor is overhauled once every two years. After 10 years of service, the valves are still original equipment. Bearings are also original equipment and have required no maintenance since startup.

Besides this Trouble-Free Performance, the user is on the "plus" side in many other respects. Among them: Smooth operation achieved by Clark Balanced/Opposed design; compactness that saves floorspace; simplified, reduced foundation requirements; inherent accessibility; marked simplicity of design.

Covering a Range of 75-8000 BHP, the Clark Balanced/Opposed, Motor-Driven line is increasingly becoming industry's preference for plant air requirements. Complete details are obtainable in Bulletin 185. Write now for your copy or get the facts first hand from your nearest Clark representative.

CLARK BROS. CO.
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CLARK

DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

Engines • Compressors
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CUT SCRAP HANDLING COSTS ½!

DUMPS ITSELF RIGHTS ITSELF LOCKS ITSELF

With Roura Hoppers on the job —you'll see as much as a 50% cut in scrap and bulk handling costs. One man will do the work of two—in less time. Roura Hoppers are the easy, safe and efficient way to handle hot or cold, wet or dry bulk . . . such things as scrap metal, glass, small castings, cinders, punch press parts, hot forgings or cullet.

Thousands of plants across the country are relying on their Roura Hoppers. Any lift truck may be used to move a loaded hopper. A simple latch lets it dump and go upright again automatically. For more information, phone us collect at TOwnsend 8-3560 or use coupon.

SPECIFICATIONS: Eight sizes, ⅓ to 4-yard capacities. Constructed of 3/16" steel plate with continuous arc-welded seams. Also available in heavier plate, galvanized, stainless or aluminum. Mounted on skids or choice of wheels. Standard models shipped from stock.

ROURA
Self-Dumping
HOPPER

WANT MORE DETAILS? Just clip this coupon to your letterhead and mail to
ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

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PROCESSING EQUIPMENT

Curing Unit—Bulletin 200 on preformer-curing oven for increased production. The W. W. Sly Mfg. Co.
Circle 258 on Post Card

Treating Equipment—General catalog covers washers, ovens, spray booths. Gallagher-Kaiser Corp.
Circle 259 on Post Card

PUMPS, COMPRESSORS

More GPM—Facts on pump that gives dependable service with greater capacity output. Ingersoll-Rand.
Circle 260 on Post Card

Dependable Compressor—Bulletin 185 describes balanced/opposed compressor line. Clark Bros. Co.
Circle 261 on Post Card

Air Compressors—Bulletin SG-3 on units for all services. Le Roi Div.
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Built for Dependability—Bulletin 3369-15 on compressors offering lower maintenance cost. Joy Mfg. Co.
Circle 263 on Post Card

ELECTRICAL

Secondary Unit Substations—Engineering data in Handbook PSG-559. Pennsylvania Transformer Div.
Circle 266 on Post Card

Motor Control Centers—Details on motor control racks designed for specific needs. Crouse-Hinds Co.
Circle 267 on Post Card

Motor Protection—Bulletin GEA-6893 tells features of Limitamp control. General Electric Co.
Circle 268 on Post Card

High Frequency Generator—Bulletin 515A-PE covers packaged high cycle generator. Robbins & Myers, Inc.
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Safe, Reliable Starter—Bulletin SM 292 on starter with visible blade safety construction. Square D Co.
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Starter With More Life—GEA-7020 on dust-, oil-, water-resistant starter. General Electric Co.
Circle 271 on Post Card

Storage Batteries—Simplified electricity bulletin tells how they work. Exide Industrial Marketing Div.
Circle 273 on Post Card

Switchgear Protection—Bulletin AR-102 covers AutoCal Unitized Power-Pack. C & D Batteries Div.
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Positive-Power Equipment—Catalog on electric battery charging equipment. Gould-National Batteries, Inc.
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These 3 VALUES are important

1. QUALITY is important. When you invest in a fence you want it to last for a long, long time. When you specify PAGE you get 77 years of our experience in the design and manufacture of a quality fence. Page Fence is engineered for long-lasting service.

2. WIDE CHOICE is important. For example, we offer a choice of 4 chain link fabrics—ACCO-Aluminized, our latest development, or galvanized steel, stainless, or solid aluminum. Each of these has characteristics which meet individual preferences or make it more suitable to meet certain climatic or service conditions. Furthermore, there are 8 basic fence designs and 6 gate styles. No other company can serve you with so wide a selection.

3. INSTALLATION is important, too. A fence can be no better than the quality of its erection. The Page Fence Member in your locality is trained, experienced, responsible, and interested in your satisfaction.

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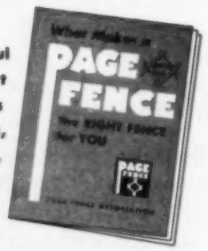
When you write us, we'll send you the whole story in a helpful booklet, and the name of our nearest Member. Call him, he will gladly suggest the best answer to your property protection problem.

Helpful booklet describes fence styles, gates and, components



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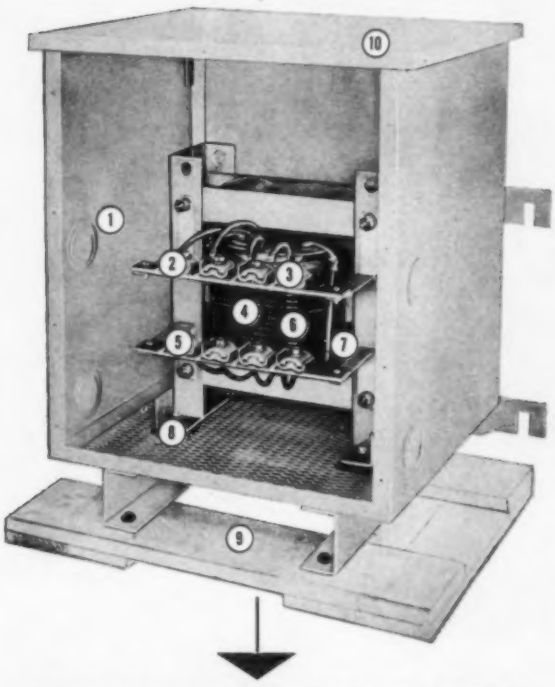

Before buying any dry type power transformers, compare the intrinsic value of Acme Electric transformers and get the extra and added features that give you better performance, quiet operation and greater value.

1. Extra large wiring compartment for ease in making connections.
2. Terminals are of the pressure-connector type — no soldering necessary.
3. No taping of connection joints — terminals are mounted on insulated board.
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7. Extremely QUIET — PRACTICALLY NOISELESS.
8. Isolating pads prevent magnification and transmission of vibration to other parts of system, thus maintaining absolute quietness.
9. Unit is shipped on skid for easy handling.
10. Unit is shipped encased in polyethylene cover which provides adequate protection and eliminates necessity for removal and disposal of bulky packing materials.

Investigate the advantages of Acme Electric dry type power transformers. Write for Dry Type Transformer Catalog.

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SAA 3452/1909

Acme ACME Electric
TRANSFORMERS

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Skilled Hands Know the Difference...

Genuine
RIDGID

At Your Supply House!
The Ridge Tool Company, Elyria, Ohio, U. S. A.
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Constant Power Supply—Facts on electrical equipment for plant lighting, operation. Westinghouse.

Circle 277 on Post Card

D-C Power to 1500 Amp—Information on rectifier power supplies, chargers. Christie Electric Corp.

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Insulated Power Cables—Details on polyethelene-insulated cables. Simplex Wire & Cable Co.

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Carries More Current—Information on Amerzone-B butyl rubber insulated cable. American Steel & Wire Div., United States Steel.

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INSTRUMENTS

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OTHER EQUIPMENT

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On Nickel Cast Iron—Booklet gives engineering properties, applications. The International Nickel Co., Inc.

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Magnetic Separators—Bulletin C5000B describes units for many uses. Dings Magnetic Separator Co.

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Air Line Filter—Staynew filters for trouble-free operation are covered in Bulletin 200. Dollinger Corp.

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Lower Clarifying Costs—Bulletin HSP-919 describes coagulant aids. Hagan Chemicals & Controls, Inc.

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Fuel Oil Additive—Details on how to put power into fuel. Oxi Corp.

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Steel Equipment—Catalog illustrates over 1500 items—shelving, cabinets, etc. Lyon Metal Products, Inc.

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Soap Economy—"Operation Pinpoint" on skin hygiene, washroom maintenance. Sugar Beet Produce Co.

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Disposable Wipers—Details on cost-cutting plan. Kimberly-Clark.

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Chain Link Fencing—Information on top grade steel fencing. The Colorado Fuel & Iron Corp.

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Chain Link Fencing—Booklet on "What Makes A Page Fence the Right Fence For You." Page Fence Association.

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This Wayne Power Sweeper and its operator are saving on *more* than plant maintenance alone. Not only do they cut plant clean-up time and eliminate costly push broom methods—but provide these *extra* advantages as well . . .

—You can clean more plant area more often, saving on damage to machinery from dust and dirt.

—You protect rolling stock against tire and caster damage.

—You maintain the sparkling surroundings your employees want and need for best efficiency.

There's hardly a spot where Waynes can't go. They work right up to machinery . . . in congested areas . . . on loading docks . . . in parking lots . . . on sidewalks—wherever debris accumulates. They pick up everything from fine dust to pop bottles—and never raise a dust cloud while doing it! *In most plants, one man and a Wayne can handle the entire sweeping program and still free the operator for other work!*

There's just one side you can choose in your own plant picture—*the Wayne clean side.* A wide range of Wayne Sweeper models are made to meet your particular plant needs . . . to cut your plant housekeeping costs.

Write Wayne for full details today!

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Circle 667 on postcard, page 33

Circle 668 on postcard, page 33 ➔

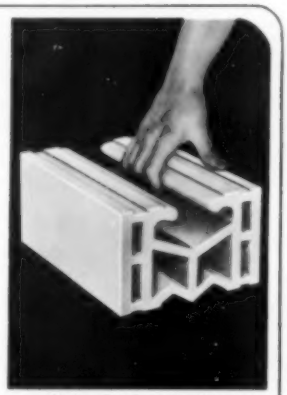
The National Biscuit Company's Fair Lawn, N.J., plant, showing exterior walls of Natco Dri-Speedwall tile.

NABISCO RECIPE FOR A BEAUTIFUL, MODERN BAKERY

26,624,850 lbs. Natco Dri-Speedwall tile

3,272,992 lbs. Natco Vitritile

Modern architectural design



Natco Dri-Speedwall tile. Nominal face size 5⅓" x 12"

Almost 30 million pounds of Natco structural clay tile products went into the construction of Nabisco's new Fair Lawn, New Jersey bakery.

Exterior walls were constructed of Natco Dri-Speedwall tile. This tile is designed to form a series of interior "V-type" channels. Any small amount of moisture that may penetrate through the exterior mortar joints is directed through these open channels and is drained off through weep holes at required locations.

Interior walls of smooth, attractive Natco Vitritile —a ceramic glazed clay facing tile—assure *complete* sanitation in mixing, baking, packaging and other inside areas.

For complete information write for catalog S-61.

Today's idea becomes tomorrow's showplace . . . when Natco structural clay products are in the picture

natco corporation

GENERAL OFFICES: 327 Fifth Avenue, Pittsburgh 22, Pennsylvania . . . Branch Offices: Boston • Chicago • Detroit • Houston • New York • Philadelphia • Pittsburgh • Syracuse Birmingham, Ala. • Brazil, Ind. . . . IN CANADA: Natco Clay Products Limited, Toronto

If you use 40-watt fluorescent lamps here's money-saving news from General Electric

It's the brightest 40-watt cool white fluorescent ever made. With the General Electric NEW F40 you get a 7% bonus in light at *no extra cost.* This extra light is worth 15¢ to 30¢ a lamp to most users. Yet the price of this lamp is the same as for ordinary fluorescents that give less light.

Now you can increase your present lighting level without spending a single extra penny for lamps, fixtures or electricity. Or, if you're putting in a new lighting installation, you can get the light level you want with fewer lamps and fixtures.

General Electric scores another first in offering you this bonus in standard 40-watt "white" fluorescent lamps. The G-E NEW F40 is rated at 3100 lumens in popular cool white, 3250 in white or warm white. That's because of three light-producing G-E Premium 3 construction features available for the first time in a lamp that sells for the same price as ordinary fluorescents—

only $1.30 for cool white, $1.35 for other "white" colors:

1. G-E wattage-miser electrode helps convert power ordinarily lost in the cathode into useful light—free.
2. New, more efficient gas mixture.
3. New electronically screened bonus-phosphor.

NEW F40 is rated at 7500 hours in Rapid Start and starter-type circuits (6000 in systems installed before 1954). In pre-'54 circuits use F40/54 lamps. You'll get 7500-hour life, same light as ordinary 40-watt fluorescents (2900 lumens) at the same price ($1.30 cool white). General Electric Co., Large Lamp Dept. C-123, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW F40

ONLY $1.30 LIST

Circle 669 on postcard, page 33

BULLETINS

(Begins on page 31)

DUST, FUME CONTROL

How To Control Dust, Fumes

Methods for controlling industrial dust and fumes are described in 20-pp Bulletin 922A. Explains advantages of proper control and lists essentials of a typical system. Describes and illustrates available types. Includes details on electric furnace exhaust hood. Pangborn Corp.

For a copy, circle 145 on Post Card

Electronic Air Cleaners

Heavy-duty electronic air cleaners with push-button automatic control are described in 6-pp Catalog 1435. Sections are devoted to principles of electronic air cleaning, construction features, selection details and application arrangements. Westinghouse Electric Corp.

For a copy, circle 146 on Post Card

Oil Mist Precipitation

Operation details of Electro-Static precipitators for elimination of oil mist and smoke are covered in Bulletin 240. Typical installations are pictured. John Wood Co.

For a copy, circle 147 on Post Card

Economical Exhaust Gas Scrubber

Bulletin 170 tells of flooded plate scrubber, giving operating data and specifications. John Wood Co.

For a copy, circle 148 on Post Card

CONSTRUCTION

Screens—Functional and Attractive

Illustrated in color, this 20-pp booklet introduces Curtainscreen, a system of interlocking components for forming exterior and interior screens, dividers and railings of all types, sizes and scales. Describes and illustrates installations, includes design details. Julius Blum & Co., Inc.

For a copy, circle 149 on Post Card

Cement Curing Facts

The why and how of curing concrete are detailed in Placard RM-124, with procedures illustrated. The Master Builders Co.

For a copy, circle 150 on Post Card

MATERIALS HANDLING

Steel Band Conveyors

"Pictures of Conveyors in Action," 16 pp, on belt conveyors, contains sections on bulk and piece goods conveying, work tables, and bed coolers. Available belt sizes are tabulated; typical installations illustrated. Sandvik Steel, Inc.

For a copy, circle 151 on Post Card

Wire Rope Conveyors, Systems

Wire rope conveyors, above and below ground, are described in 24-pp Bulletin 173. Illustrated with sketches, product photos and charts, presents advantages of the conveyors, basic types of head sections, electricals, power units, idlers, wire rope supports, belt take-ups, auxiliary equipment. Hewitt-Robins.

For a copy, circle 152 on Post Card

For Heavy, Hot, Rough Loads

Bulletin MF-600-A, 6 pp, illustrates and describes types and sizes of hinged-steel belting and accessories, with design features and specifications included. May-Fran Mfg. Co.

For a copy, circle 153 on Post Card

Portable Conveyor Units

Operating principle of Airveyor transfer units is described in Bulletin A-20, with drawings showing typical applications, and capacity ranges charted. Fuller Co.

For a copy, circle 154 on Post Card

Conveyor System Selection

Fact File ER-G-10 aids in selecting pneumatic conveyor systems. A table lists major types of systems and their operating characteristics; another lists 78 typical products and type of system best suited to each. Fuller Co.

For a copy, circle 155 on Post Card

Vibrating Conveyors

Natural frequency vibrating conveyors with variable stroke positive drive are detailed in Bulletin 361. Charts show trough dimensions and models' ton-per-hour capacity for lumpy, bulky and fine materials. Stephens-Adamson Mfg. Co.

For a copy, circle 156 on Post Card

Metal Chip Handling Systems

How company's chip handling system separates trash, products, bar ends from wet chips; crushes chips, extracts and purifies oil; and loads out or stores the clean, crushed chips, is told in 12-pp Book 2926. Advantages are detailed and installations pictured. Link-Belt Co.

For a copy, circle 157 on Post Card

Improved Hand Chain Hoist

Advantages of Spiroid gear transmission in Porta-Hoist, an aluminum hand chain hoist are detailed in 8-pp Bulletin ADH 76. Includes specifications and dimensions for 11 models, capacity from ½ to 12 tons. Coffing Hoist Div., Duff-Norton Co.

For a copy, circle 158 on Post Card

Nylon-Webbing Slings

Bulletin 661 describes nylon and Dacron slings for handling parts having surfaces that must not be marred or scratched. Table of safe loads given. The Caldwell Co., Inc.

For a copy, circle 159 on Post Card

Data on Plywood Pallets

This literature package includes a specifications bulletin for plywood pallets covering types of plywood, grades, designs, styles and construction techniques, nomenclature and definitions, materials and species of lumber, permissible lumber characteristics, methods of fastenings, etc. Other bulletins cover plans for 24 plywood pallets and case histories. Douglas Fir Plywood Association.

For a copy, circle 160 on Post Card

Loading, Unloading Systems

Pallet loaders, unloaders and segregating systems are described in this illustrated 20-pp bulletin. Construction and design features, operating descriptions, flow diagrams and specifications are covered. Packing Equipment Div., FMC Corp.

For a copy, circle 161 on Post Card

STORAGE EQUIPMENT

Space-Saving Storage Racks

Space efficiency through use of continuous metal channeling and a variety of fittings is illustrated in 24-pp Catalog 620. Typical applications and simple assembly instructions covered. Unistrut Products Co.

For a copy, circle 162 on Post Card

Custom-Designed Steel Equipment

Twenty-page catalog "Craftsmen in Sheet Metal" illustrates what happens from idea to finished product when custom-made installations are needed. Typical units are pictured, and a list of equipment showing dimensions and capacities is included. Lyon Metal Products, Inc.

For a copy, circle 163 on Post Card

Postage-free cards for ordering Bulletins are on pages 33-34. You may also use the cards to order literature mentioned in the ads.

Space-Saving Steel Shelving

Three basic types of Hallowell steel shelving, assembly features, component parts and practical advantages, are described in 36-pp Catalog 2791. Discussed and pictured are two types of adjustable shelving (Erectomatic and Erectomatic Clip Type) and fixed-type shelving. Columbia-Hallowell Div., Standard Pressed Steel Co.

For a copy, circle 164 on Post Card

INSTRUMENTS, CONTROLS

Centralized Controls for Industry

Twelve-pp Bulletin C-6300 is an easy guide for laying out and designing special or standard control centers. Describes features, and gives specifications, selection tables and optional modifications or additions. Monitor Controller Div., Atlee Corp.

For a copy, circle 165 on Post Card

Petroleum, Industrial Meters

Thirty-pp Catalog P&I-2000 describes various meters, packaged units for volatile liquids, and the Turbo-Meter. Cutaway drawings show construction features and dimensions. Accessories described include electrical impulse contactors, key control panel, air eliminators, line strainers, registers, others. Rockwell Mfg. Co.

For a copy, circle 166 on Post Card

Pneumatic Temperature Transmitter

Described in 12-pp Bulletin 13-17C is a pneumatic temperature transmitter featuring force-balance operation. Includes specifications, description of

BULLETINS

(Begins on page 31)

operating principle, table of temperature range, and data on related accessories. The Foxboro Co.

For a copy, circle 167 on Post Card

By-Pass Rotometers

Economical measurement and control of large flow in pipe up to 48 in. is described in Bulletin 116, 8 pp. Covers capacity determination, flow range and piping requirements. Brooks Instrument Co. Inc.

For a copy, circle 168 on Post Card

Automatic Heating Controls

This 98-pp catalog covers a complete line of heating controls, including Sheer Line room thermostats and Midgitrol compact gas valve. Features are described, specifications supplied and applications detailed. Comprehensive index lists parts by names and by numbers for quick reference. General Controls Co.

For a copy, circle 169 on Post Card

For Liquids, Gases, Cryogenics

Turbine flowmeters for measuring flow rate and total flow, and for automatic process control in batching and blending systems are featured in 12-pp Bulletin 1384-C. Includes technical information on ranges, accuracies, frequency outputs, accessory equipment. Cox Instruments Div., George L. Nankervis Co.

For a copy, circle 170 on Post Card

Self-Contained Scales

Bulletin 8003, 12 pp, describes warehouse scales for various applications, listing construction features and installation data. Specification charts and drawings for aid in planning, included. Fairbanks, Morse & Co.

For a copy, circle 171 on Post Card

Transistorized Sound Survey Meter

Bulletin K 18 C describes a hand-held sound survey meter weighing only 1 lb with battery. Explains advantages of the inexpensive, rugged little instrument, including ability to measure relative magnitudes of vibration. The Korfund Co.

For a copy, circle 172 on Post Card

Recording, Alarm Scanning Systems

Modular digital data systems for alarm scanning and digital recording of virtually any type or combination of analog values are described in 8-pp Systems Brochure 7000. Discusses features, applications; illustrates building blocks and sub-assemblies available. Monitor Systems, Inc.

For a copy, circle 174 on Post Card

LIGHTING

Floodlights for Service Areas

Bulletin MF-261 describes and illustrates features and advantages of the Mercflood with long-lasting mercury vapor lamp. Rated life is approx. 7000 hr. Price Sheet is included. Appleton Electric Co.

For a copy, circle 175 on Post Card

New Design, More Light

Mark II Mainliner, a commercial recessed fluorescent luminaire, is illustrated and described in Booklet B-8235, 10 pp. Construction fixture and the style combinations are detailed. Westinghouse Lighting Div.

For a copy, circle 176 on Post Card

Surface Incandescent Fixtures

Twelve-page Brochure 28 describes functional and decorative lighting fixtures for stem or surface mounting. Each model is pictured, with cutaway views showing dimensions and maintenance features. Lightolier.

For a copy, circle 177 on Post Card

Emergency Lighting Equipment

Eight-pp Technical Handbook Form 6527 contains detailed specification data on automatic battery-powered lighting equipment. Lamp illumination time table, suggested methods for providing emergency lighting in adjacent areas, table of weights and dimensions included. The Electric Storage Battery Co.

For a copy, circle 178 on Post Card

MAINTENANCE

Concrete Water Repellent

Powder and liquid integral concrete water repellents are described in this 6-pp catalog. Includes specifications for mechanically- and job-mixed concrete, bonding new cement to old, monolithic cement floors, topping. Sun Chemical Corp.

For a copy, circle 179 on Post Card

Coatings, Synthetic Compounds

Recent developments in synthetic rubber compounds and protective coatings—vinyls, epoxies, acrylics, alkyds, etc.—are described in 16-pp DEL Bulletin 105. Provides descriptive and application information. David E. Long Corp.

For a copy, circle 180 on Post Card

Epoxy Products Ordering Guide

Technical and application data on Helix bonding agents, potting compounds, sealants, coatings and accessories are provided in this 48-pp 1961 catalog. Also announces new epoxy products representing break-throughs in high temperature, thermal conductivity, lightweight and one-component epoxy formulations. Prices included. Carl H. Biggs Co., Inc.

For a copy, circle 181 on Post Card

HEATING, COOLING

Heating, Cooling, Heat Transfer

Technical Data Bulletin 356 contains 26 pp of information on panel type heat transfer coils, including an instantaneous LMTD chart, typical load computations, heat transfer factors, selection of heating surface and other selection details. Tables and charts included, also dimensional diagrams. Dean Products, Inc.

For a copy, circle 182 on Post Card

Radiant Heat Equipment

Principle of radiant heat and equipment designed for utilization of the electric infrared radiant heating process are detailed in this 8-pp bulletin. Applications in paint baking on metal, and in food, plastic, adhesive, electronic, printing, paper, textile etc. fields described. Fostoria Corp.

For a copy, circle 183 on Post Card

OTHER EQUIPMENT

Chemicals—For Use and Study

This 16-pp 1961 catalog describes 108 organic and inorganic chemicals. Covers 87 produced in commercial quantities, 14 market-development products and seven product development chemicals available in limited quantities. Provides physical data, uses, shipping methods. Hooker Chemical Corp.

For a copy, circle 184 on Post Card

Silicone Rubber—Uses and Abuses

This informative 56-pp book covers silicone rubber from processing, cost and supply sources to properties and features. Among subjects treated are classifications of silicone rubber; durometer; resistance to weather, heat, solvents, chemicals; dielectric properties; use of silicones in fluids; hybrids. Charts, photos and tabular data accompany text. Mechanical Rubber Products Co.

For a copy, circle 185 on Post Card

Buffing, Polishing Compounds

Twenty-page Catalog Co-105 describes liquid and bar compounds for automatic and manual operations. Principal classifications are listed and recommendation charts show suggested compounds for various metals. Compounds for finishing hard rubber and plastic also covered. Hanson-Van Winkle-Munning Co.

For a copy, circle 186 on Post Card

Materials Dispensing Units

Air-powered equipment and accessories for materials dispensing are described in Catalog 42, 32 pp, with photos showing actual installations of various units. Selection and specification charts included, also factors in selection of equipment. Lincoln Engineering Co.

For a copy, circle 187 on Post Card

Fire Safety Equipment

Portable fire extinguishers, smoke and fire detectors, and built-in carbon dioxide systems are featured in 12-pp Brochure P-67. Includes chart outlining types for ordinary combustible, flammable liquid, and electrical fires. Walter Kidde & Co., Inc.

For a copy, circle 188 on Post Card

Air and Hydraulic Equipment

Air control products for automating in-plant operations are featured in 48-pp digest-size Catalog 125, including cylinders, valves, rotating joints, filters, regulators, couplers and hose fittings. Data on dimensions, flow rates, operating pressures included. A. Schrader's Son, Div. Scovill Mfg. Co., Inc.

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We challenge anyone to beat this starter!

When you speak this plainly, it takes a top quality product to back up your words. We are certain of that backing in the Clark Type CM Manual Starter, the starter that challenges comparison with any other manual starter available today.

It's built to standards usually found only in magnetic starters. Combines not just a few, but ALL modern features... simplest to install, easiest to maintain, smoothest and most positive in its action... assures maximum protection and safety, greatest dependability and longest life.

Here's the manual starter that will do a better job on your very next installation. Please accept our challenge. Ask for the Clark Type CM Manual Starter at your wholesaler's. Give it a try. We believe that its performance will convince you. 61M01

JUST A FEW OF MANY OUTSTANDING CLARK FEATURES:

- Smooth, positive, tease-free, snap action operation
- Large double-break, weld-resistant contacts, easily inspected and replaced
- Built-in arc barriers
- Three separate safe-locking features
- Recessed operating handle
- Optional third line overload
- Straight-through wiring, plenty of knockouts
- Trip-free operation
- Exclusive terminal design, assuring tight connections, even for two wires of unequal size
- Dual operating springs, either one strong enough to operate starter

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Circle 670 on postcard, page 33

DATA FILE OF LITERATURE FOR THE PLANT ENGINEER'S LIBRARY

STANDARD CATALOGS, bulletins and handbooks are described here to help plant engineers maintain a permanent data file. To order this free literature, use Reader Service Cards provided for you on pages 33-34.

CONSTRUCTION

Steel for Structures, Equipment

"New Concepts in Steel Design and Engineering," 59 pp, describes and compares types that make up the modern family of constructional steels. Illustrations of actual designs and concepts show how these steels can be used. U. S. Steel Corp.

For a copy, circle 301 on Post Card

Steel Joist Construction

Standard and long span open web steel joists are illustrated in this 38-pp catalog. Advantages, design and properties of the construction are detailed. American Bridge Div., United States Steel Corp.

For a copy, circle 302 on Post Card

Structural Clay Products

Descriptive information and construction details on structural clay building materials are given in 24-pp Catalog S-61. Characteristics and advantages of facing tile, bricks, other products, are detailed. Natco Corp.

For a copy, circle 303 on Post Card

Built-Up Roofing Specifications

General requirements for built-up roofing are covered in this 28-pp 1961 manual, with roof selector guide and application information. Covers steep deck and dead level roofs, spray pond roofs, promenade tile roofs, roofing over existing roofs, insulation. The Philip Carey Mfg. Co.

For a copy, circle 304 on Post Card

For Fire-Retardant Ceilings

Advantages and applications of fire-retardant ceilings are detailed in 8-pp bulletin. Installations are pictured. Armstrong Cork Co.

For a copy, circle 305 on Post Card

Packaged Industrial Doors

Ready-to-install door assemblies, including shock absorber doors and fire door operators, are featured in 8-pp Catalog 178. Specifications, construction details. Clark Door Co., Inc.

For a copy, circle 306 on Post Card

Rolling Steel Doors

Details on rolling steel doors, grilles and shutters are presented in 16-pp Catalog G-61. Includes specifications, installation diagrams, tables of clearances. The R. C. Mahon Co.

For a copy, circle 307 on Post Card

Acrylic Plastic Sheet

Properties and characteristics of Plexiglas acrylic plastic sheet are detailed in 12-pp Booklet PL-415. Applications shown. Rohm & Haas Co.

For a copy, circle 308 on Post Card

Non-Slip Steel Flooring

Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of 8-pp Booklet AL-29. Alan Wood Steel Co.

For a copy, circle 309 on Post Card

Safety Grating for Industry

Steel, aluminum and stainless steel grating is featured in Catalog 5911, 24 pp. Shows installation and erection. The Globe Co.

For a copy, circle 310 on Post Card

For Heavy Duty Applications

Bulletin MP-4d explains how Masterplate concrete floors last six times longer than many others. Installation information and typical applications shown. The Master Builders Co.

For a copy, circle 311 on Post Card

Aluminum Stair Treads, Grating

Details on aluminum stair treads and grating featuring one-piece construction are presented in Bulletin AD-679. Types of finishes, sizes and weights available are listed. Aluminum Co. of America.

For a copy, circle 312 on Post Card

Screw Fastening of Aluminum

This 48-pp technical handbook covers standard and special fasteners and fastening systems used to join aluminum assemblies. Includes list of manufacturers of screw fasteners. Reynolds Metals Co.

For a copy, circle 313 on Post Card

MATERIALS HANDLING

Portable Electric Hoists

Eight-pp Bulletin 15010 describes push button or pull cord control portable electric hoist. Cutaway views showing component features given. Manning, Maxwell & Moore, Inc.

For a copy, circle 314 on Post Card

Portable Hoist or Pull Unit

A labor-saving portable, manually-operated hoisting and pulling machine for a variety of industrial applications is described in this product bulletin. Operation details, specifications given. Griphoist, Inc.

For a copy, circle 315 on Post Card

Why Self-Dumping Hoppers

Cost-saving advantages of self-dumping steel hoppers for bulk handling are detailed in Bulletin 265. Roura Iron Works, Inc.

For a copy, circle 316 on Post Card

On Conveyor Chain Selection

This 38-pp engineering reference book contains information on selection, installation, and maintenance of chain for conveying and elevating. Comparison tables provided. Moline Malleable Iron Co.

For a copy, circle 317 on Post Card

Sheet, Coil Lifters, All Types

Detailed information on sheet and coil handling lifters and related equipment is presented in 24-pp Bulletin SL-32. Applications are pictured. Cullen-Friestedt Co.

For a copy, circle 318 on Post Card

STORAGE, SHOP EQUIPMENT

Steel Equipment Selection

Catalog 100 K contains 100-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, bins. Lyon Metal Products, Inc.

For a copy, circle 319 on Post Card

Steel Shelving and Equipment

Illustrated in 8-pp Form 2715 is quick-erection, adjustable steel shelving for maximum space saving, as well as tool stands, benches, cabinets. Standard Pressed Steel Co.

For a copy circle, 320 on Post Card

HEATING, VENTILATING

Industrial Unit Heaters

Direct-fired, vertical delivery unit heaters, designed to solve heating problems in commercial and industrial buildings, are covered in 6-pp Bulletin IGV-660. Modine Mfg. Co.

For a copy, circle 322 on Post Card

Heaters For Industrial Applications

Detailed information on electric heaters is given in 20-pp Bulletin EC-261-R. Illustrates suspension or portable and duct heaters, natural and radiant convection heaters, infra-red heaters. Electromode Div.

For a copy, circle 323 on Post Card

Electric Comfort Heating

Application information on electric comfort heating equipment is presented in 16-pp Caatlog 975-D. Includes dimensions and engineering data on baseboard heaters, forced air wall insert heaters, radiant heaters, floor drop-in types, cabinet convectors, others. Edwin L. Wiegand Co.

For a copy, circle 324 on Post Card

Gas-Fired Unit Heaters

Operating principles, selection factors, applications and specifications for propeller, duct, blower and heavy-duty type heaters are outlined in this 16-pp bulletin. Janitrol Heating and Air Conditioning Div.

For a copy, circle 325 on Post Card

Heater Test Code

Presented in 22-pp Bulletin 20 is a revised code for testing propeller-type steam unit heaters. Establishes uniform methods for tests on heaters using dry steam as heating medium and serves as a standard for developing performance ratings. Air Moving & Conditioning Ass'n, Inc.

For a copy, circle 326 on Post Card

where to use gas-fired heaters in plants

Free from Reznor: Our just published handbook, "Industrial Applications of Direct Gas-Fired Heaters," tells all about the profitable use of Reznor heaters in manufacturing plants.

Use it to find out the many advantages—and economies, too—of using Reznor unit heaters for comfort heating of work or storage areas. For example, you can spot the heaters exactly where heat is needed, without installing long piping runs from a remote central boiler that may already be overloaded. You can use Reznor Aluminized or stainless steel duct furnaces for tempering make-up air or heating process air. Or use them in year-round heating and cooling systems. (Reznor duct furnaces are A.G.A.-approved for downstream applications.)

Among other subjects covered: How to blanket shipping doors, how to install heaters 40 ft. high to clear craneways; how to use Reznor heaters for stand-by operation on liquefied petroleum gas—with city gas as standard fuel.

Published by Reznor, the world's largest manufacturer of gas unit heaters, the handbook is yours free. Mail the coupon—or, call your Reznor distributor or district office, listed in the Yellow Pages under "Heaters—Unit."

REZNOR HEATERS

REZNOR MANUFACTURING COMPANY
Department PE-10, Mercer, Pennsylvania
Send me a copy of "Industrial Applications of Direct Gas-Fired Heaters."

name_____ title_____
company_____
address_____
city_____ state_____

Circle 671 on postcard, page 33

DATA FILE

(Begins on page 270)

Hot Water for Industrial Plants

Cost-saving ideas on water heating installations, estimating hot water requirements for industrial and manufacturing use, sizing data and installation instructions are given in 100-pp Manual CH-110. Specifications, applications and water heater models provided. A. O. Smith Corp.

For a copy, circle 327 on Post Card

Efficient Roof Ventilators

Engineering data on roof ventilators, fans and blowers—including the Vertiget, automatic Airjet, reversible, mushroom head and stack cap types—is presented in 16-pp Bulletin A-112E. Hartzell Propeller Fan Co.

For a copy, circle 328 on Post Card

Direct Connected Fans

Bulletin 690-A, 12-pp, gives dimensions, application and performance data on fans for general and system ventilation and power roof ventilators. Robbins & Myers, Inc.

For a copy, circle 329 on Post Card

Air Supply and Exhaust Fan

Details on an air handling unit which performs simultaneously both air supply and exhaust functions are given in Bulletins 552-A. Clarage Fan Co.

For a copy, circle 330 on Post Card

SIX COMMON PLANT FACILITIES...

ONE COMMON PROBLEM...

...LICKED BY E.R.P. CATHODIC PROTECTION

The problem common to all buried or submerged metals is corrosion. Electro Rust-Proofing stops corrosion . . . stops it permanently, efficiently, economically.

E.R.P. engineers survey your protection needs and design the best system for you. Then cathodic protection takes over. Your tanks and piping, piers and towers, stay like new. E.R.P. systems eliminate downtime for repairs, cut painting and labor costs. You get sure protection. Your corrosion worries disappear.

E.R.P. is a firm of specialists in corrosion prevention. E.R.P. research for over 25 years has developed new metals, new techniques, lower costs for cathodic protection. To put them to work for you, write Dept. E.57.72.

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Circle 672 on postcard, page 33

Power Roof Ventilators

Detailed specification data on direct-driven low silhouette type propeller roof ventilators for exhaust and supply ventilation is presented in 8-pp Bulletin DB3-100. Covers features and advantages. Ilg Electric Ventilating Co.

For a copy, circle 331 on Post Card

Make-Up Air Solutions

Bulletin EN-5911 explains how air properly introduced eliminates problems arising when fans draw fumes, smoke or odors. Reznor Mfg. Co.

For a copy, circle 332 on Post Card

Air Handling Equipment

Product Bulletin B-5216 describing air handling, air cleaning, air conditioning and mechanical draft equipment, including heating and ventilating equipment, industrial process and mechanical draft apparatus, others. Westinghouse Electric Corp.

For a copy, circle 333 on Post Card

Air Moving Equipment

Bulletin DB-45, 20 pp, contains data on roof ventilators, bifurcators, axial flow vent sets, and air jets with ratings. DeBothezat Fans Div., American Machine and Metals, Inc.

For a copy, circle 334 on Post Card

Industrial Exhausters

Three types of industrial exhausters—material handling, air handling and open wheel—are detailed in 32-pp Bulletin F1-110-B. Design construction, performance, capacity ratings and dimension data given. Buffalo Forge Co.

For a copy, circle 335 on Post Card

Rotary Positive Blowers

How a lobe-type, rotary positive displacement blower delivers a metered amount of air against varying pressures with a minimum amount of friction is explained in 12-pp Bulletin S-32-A. Diagrams and charts illustrate design, dimension and performance data for vertical and horizontal models. Sutorbilt Corp.

For a copy, circle 336 on Post Card

DUST, FUME CONTROL

Dust Collection, Recovery

Collecting, recovery and classifying equipment is presented in this product bulletin. Covers electric precipitators, mechanical collectors, bag collectors, classifiers, fans. Buell Engineering Co., Inc.

For a copy, circle 338 on Post Card

Dust and Fume Control Systems

Industrial applications of company's dust and fume control systems are illustrated and described in 50-pp Bulletin PE1-2. Design and specification data on centrifugal collectors included. The Kirk & Blum Mfg. Co.

For a copy, circle 339 on Post Card

Cabinet Dust Collectors

Self-contained cloth-filter type dust collectors are described in 6-pp Bulletin 359. Torit Mfg. Co.

For a copy, circle 340 on Post Card

YOU'RE LIGHT YEARS AHEAD
WITH WESTINGHOUSE
LIFEGUARD® MERCURY LAMPS—Improved design now gives 70% longer service life (12,000 hours) and delivers more light (up to 25% more) throughout life. Special "Weather Duty" outer bulb resists thermal shock and corrosive industrial fumes.
NEW HIGH EFFICIENCY FLUORESCENT LAMPS—Just snap them into your regular preheat-rapid start and slimline fixtures. Give up to ⅓ more light at no extra cost. A different kind of light, too—soft, green-white that is comfortable and easy to work under.
BRIGHTEST FLUORESCENT LAMPS—Super Hi Output (1500 ma.) lamps provide high levels of light with fewer fixtures. Westinghouse designed lamps maintain highest light output throughout long life. Smooth, lighter weight tube is easier to clean and costs less than heavier, less efficient types.

CUT LIGHTING COSTS WITH WESTINGHOUSE LAMPS

The lamps shown above are just three of more than 8000 Westinghouse lamp types designed to give the most efficient lighting. To realize the lowest possible lighting costs, take advantage of the Westinghouse Lighting Cost Reduction Plan. It can help you save in one or more of these ways:

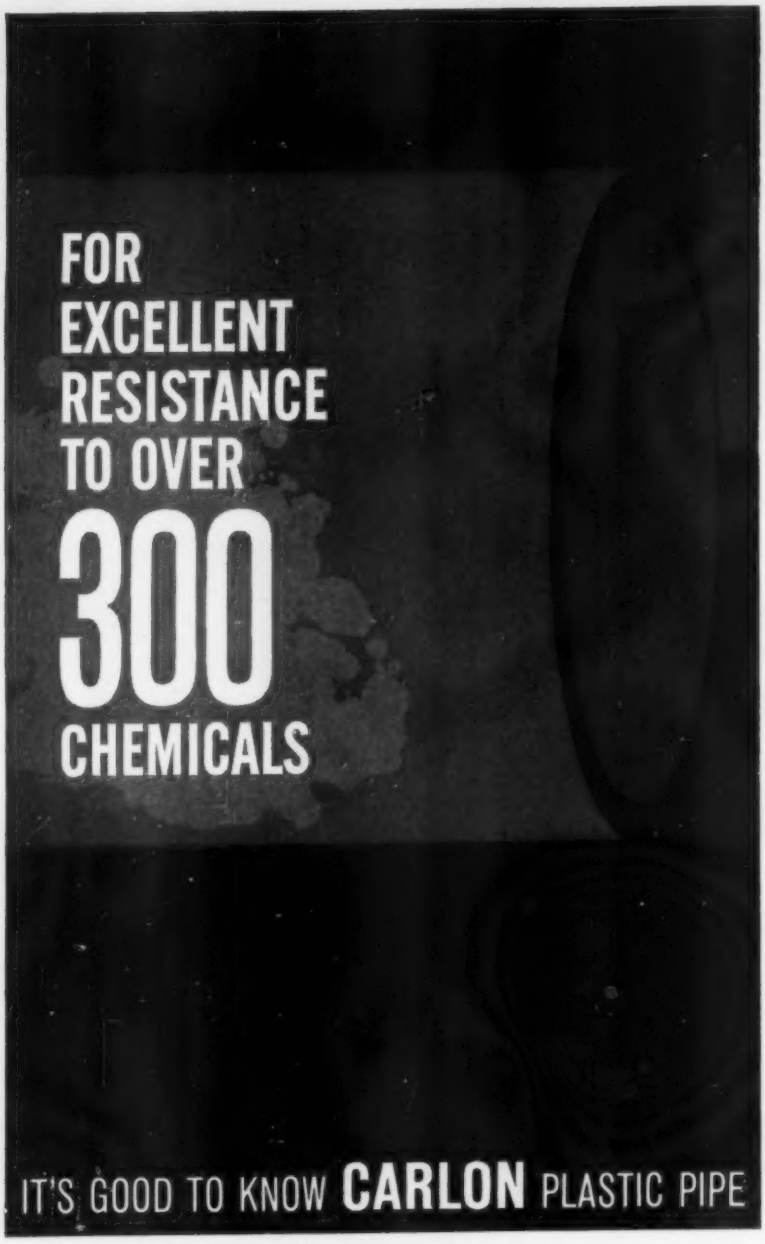
1. **Reduce your cost of lamp purchases**
2. **Reduce your lamp replacement labor costs**
3. **Increase your lighting level for the same or lower power costs**
4. **Give you more efficient use of power**

Your Westinghouse representative will be glad to show you how to apply the Lighting Cost Reduction Plan to your installation. For full information, contact your authorized Westinghouse Lamp Agent, or your Westinghouse Lamp Division Sales Office.

You can be sure . . . if it's **Westinghouse**

Westinghouse Lamp Division, Westinghouse Electric Corporation, Bloomfield, N.J.

Circle 673 on postcard, page 33



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Please send me the new Plastic Pipe Fact-pak.

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ADDRESS_____
CITY_____ STATE_____

Circle 674 on postcard, page 33

DATA FILE

(Begins on page 270)

MECHANICAL POWER TRANSMISSION

Adjustable Speed Fluid Drives

Bulletin 9819, 8 pp, describes adjustable speed Gyrol fluid drives, 1- to 25-hp, giving advantages, applications, components and operation. Industrial Div., American-Standard.

For a copy, circle 342 on Post Card

Variable Speed Drives

Included in this 112-pp catalog on integral and fractional horsepower drives are selection tables, cutaway drawings and illustrations of modifications, including single, double, and triple reductions, horizontal, single and double worm assemblies. Sterling Electric Motors, Inc.

For a copy, circle 343 on Post Card

Adjustable Speed Drives

Details on four adjustable speed drives for a variety of industrial applications are presented in 6-pp Bulletin 2900. Table lists specifications for Adjusto-Spede, Magnetic Drive, Select-A-Spede, and Allispede types. The Louis Allis Co.

For a copy, circle 344 on Post Card

Guide to V-Belt Drives

Compact Dyna-V drives engineered to utilize full performance possibilities of synthetic fibers, synthetic rubbers and alloy metals are featured in 40-pp Bulletin A695A. Includes detailed selection tables, horsepower ratings, service level data. Dodge Mfg. Corp.

For a copy, circle 345 on Post Card

Multiple V-Belt Drives

Catalog DH-901, 24 pp, lists advantages and features of the HC V-belt drive designed to reduce drive costs and require 50 per cent less space. Ratings, installation information and drive selection tables given. The Gates Rubber Co.

For a copy, circle 346 on Post Card

Standard Spring Clutches

Described in this 30-pp catalog are five lines of spring clutches in bore sizes from ⅛ to 1 in., torque capacity to 1250 lb-in. for applications utilizing drive up to 5 hp. Clutches include over-running and back-stopping; indexing; on-off; on-off indexing; and safety lock control. Marquette Div., Curtiss-Wright Corp.

For a copy, circle 347 on Post Card

Heavy-Duty Couplings

Catalog 70, 12 pp, contains engineering and application data on dihedral spindle shaft couplings for mills and allied equipment for metals, paper, rubber, chemical, food industries. Ajax Flexible Coupling Co., Inc.

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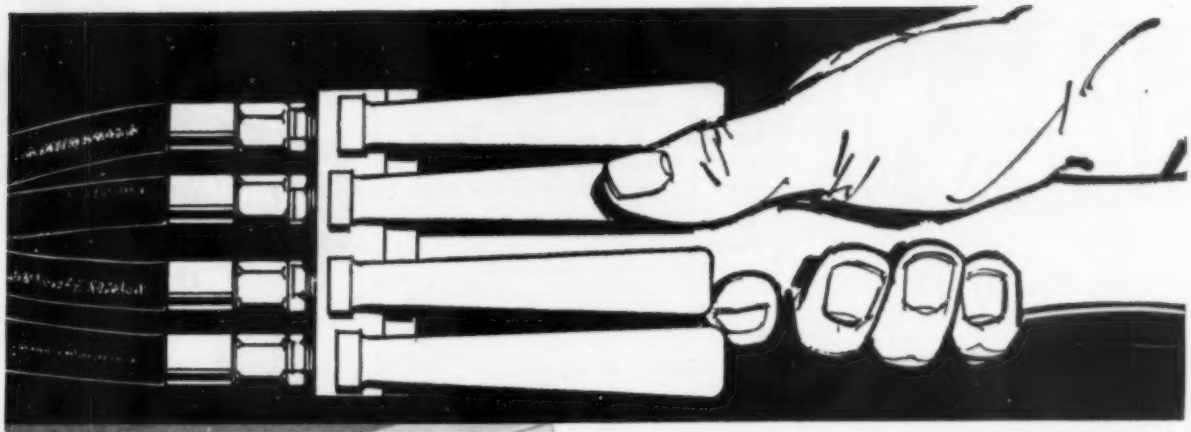
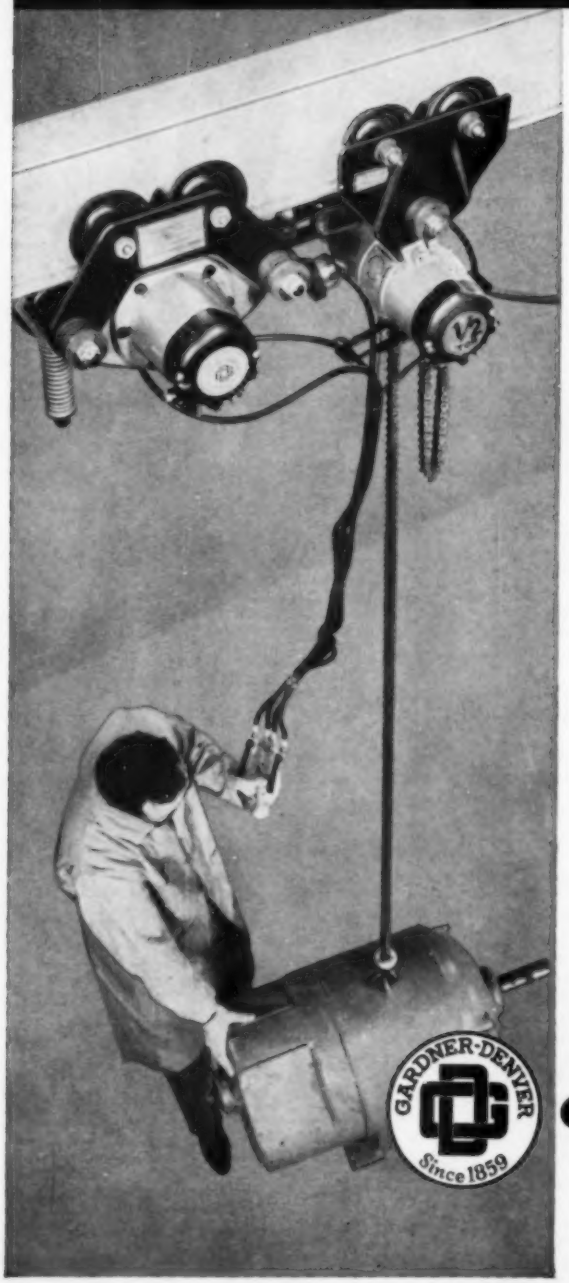
Couplings for Many Services

Product bulletins on couplings for industrial applications is presented in this note-book containing engi-





POWER TEAM ON THE BEAM

Gardner-Denver "Hoistractor"® and air hoist combination teams two-way power to save time and reduce fatigue. Hoist lifts and lowers . . . "Hoistractor" moves hoist and load along the beam. Section 86 and 87 bulletins.

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Circle 675 on postcard, page 33

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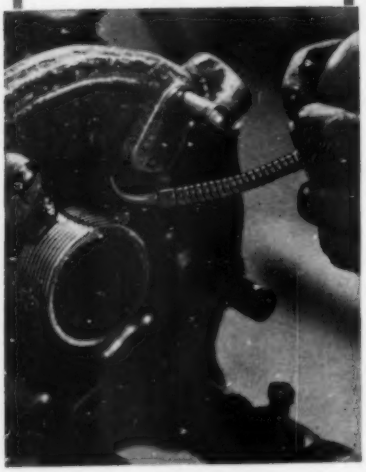

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Circle 676 on postcard, page 33

DATA FILE

(Begins on page 270)

neering data, instruction sheets, and prices. Koppers Co., Inc.

For a copy, circle 349 on Post Card

Anti-Friction Bearings

Catalog 424-D, 8 pp, gives capsule presentation of company's line of anti-friction bearings, describing each product. SKF Industries, Inc.

For a copy, circle 350 on Post Card

Ball Bearing Pillow Blocks

Heavy duty pillow blocks with self-aligning, single row, deep-groove precision ball bearings are featured in Folder 2951. Interchangeability chart included. Link-Belt Co.

For a copy, circle 351 on Post Card

Controlled Tensioning

Bulletin 4161 tells how use of drive tensioner eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage. Brewer Machine & Gear Co.

For a copy, circle 352 on Post Card

Roller Chain Applications

Presented in file folder are design ideas on efficient use of roller chain. Provides mechanical drawings showing roller chain used as slat conveyer, reciprocating drive, feed roll drive chain roller bearing, gears, flexible shaft coupling, rack and pinion table feed. Atlas Chain & Mfg. Co.

For a copy, circle 353 on Post Card

PACKINGS, GASKETS

Mechanical Packings

Featured in 24-pp Catalog 60 are multi-purpose Bel-Vee V-ring packings, criss-cross braid packing, twisted foil packings, for oil and distillate temperatures to 1000 F. The Belmont Packing & Rubber Co.

For a copy, circle 354 on Post Card

Compression Packings

Featured in this 22-pp catalog are compression packings, including sheet and rod seal types, packing materials, and list of packings for various services. E. F. Houghton & Co.

For a copy, circle 355 on Post Card

Improved Gasket Materials

Factors to consider in choosing gasket materials are outlined in 24-pp Bulletin AD-190. Includes selection tables, resistance ratings, design information. Describes characteristics of rubber sheet, compressed asbestos sheet, woven asbestos, vegetable fiber, other materials. Garlock Inc.

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Piston Packing Data

Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumpcups for packing pistons of air and hydraulic cylinders, and reciprocating pumps. Darling Valve & Mfg. Co.

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For series or universal motors 1/15 hp or less	0 to rated	1701-AU $95	–
For shunt or compound motors 1/12 hp to 1/6 hp	0 to rated 0 to 1.25x rated 0 to 1.5x rated	1703-A $110	1703-BW $90
For shunt or compound motors 1/4 hp to 1/3 hp	0 to rated 0 to 1.15x rated	1700-B $180	1700-CW $155
For shunt or compound motors 1/2 and 3/4 hp	0 to rated 0 to 1.15x rated	1702-A $255	1702-BW $215

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Circle 678 on postcard, page 33

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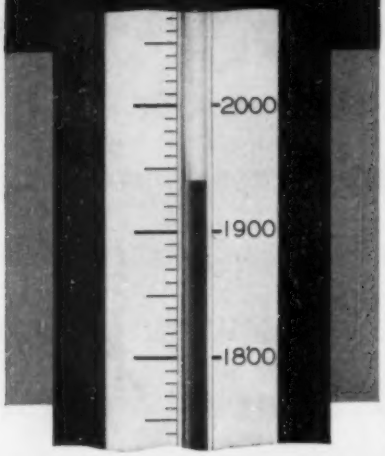

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KING-GAGE CATALOG 1010 gives further details; show many applications. Write for it.

KING ENGINEERING CORP.
3231 S. State St. Ann Arbor, Mich.

Circle 679 on postcard, page 33

DATA FILE

(Begins on page 270)

PUMPS, COMPRESSORS

Pump Selection Catalog
Included in 12-pp, easy-to-use Circular 184 are charts showing temperature ranges from —350 to +1000 F, and pressures to 1000 sig for 10 classifications of pumps. Dean Brothers Pumps, Inc.

For a copy, circle 358 on Post Card

Stainless Steel Pump Data
Stainless steel, nickel, Monel and other alloy pumps for handling corrosive liquids and those not permitting contamination are described in 8-pp bulletin. Viking Pump Co.

For a copy, circle 359 on Post Card

Vertical Pump for Industry
Cutaway view showing design and mechanical features of vertical pumps for application in sump pumps, cooling tower service, raw water supply, circulating pumps, other services provided in Bulletin 1030. Johnston Pump Co.

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Feather Valve Compressors
Installation advantages, operation and maintenance details for YC and DYC feather valve compressors, from 75 to 350 hp, are outlined in 32-pp Bulletin 3620-BI. Worthington Corp.

For a copy, circle 361 on Post Card

Water-Cooled Compressors
Described in Bulletin LA-1 are the LA and LB water-cooled compressors, the LA for operation at normal plant pressures and the LB for high pressure use. Gardner-Denver Co.

For a copy, circle 362 on Post Card

Multi-Stage Compressors
Bulletin 150, 64 pp, presents multi-stage centrifugal compressors in horizontally-split and vertically-split types. Advantages, construction features and applications of each are covered. Fundamentals of centrifugal compressors and drivers for them are discussed. Clark Bros. Co.

For a copy, circle 363 on Post Card

Heavy Duty Air Compressors
Performance details and basic construction features of heavy duty air compressors for continuous operation are detailed in 36-pp Bulletin A-43. Data tables included. Joy Mfg. Co.

For a copy, circle 364 on Post Card

Rotary Air Products
Performance curves and engineering tables along with data on features and advantages of rotary air products, including air motors, air compressors, vacuum pumps given in 12-pp Catalog 660. Gast Mfg. Corp.

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Compressed Air Fundamentals
Sixteen-pp Form 1548A on selecting a small packaged air compressor discusses compressed air and how it is

For corrosive service
THE MOST SUCCESSFUL VALVE IDEA IN YEARS!

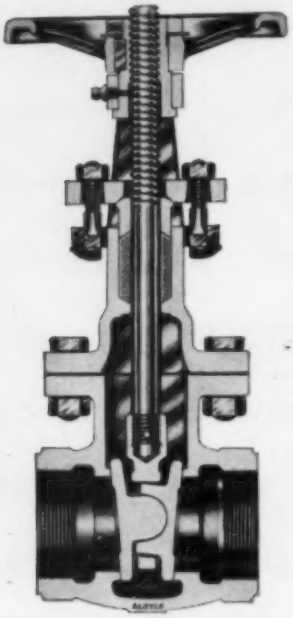


Fig. 110

This Aloyco Valve design was the pioneer! It's also the most imitated valve design in years. It met with immediate success in the chemical and petroleum fields and has found constantly growing acceptance throughout the processing industry for over a quarter of a century. Valve Fig. 110 (screwed), Fig. 116 (butt welding), Fig. 114 (socket welding), Fig. 111 (flanged) feature double disc ball and socket wedges with free floating, self-adjusting disc position which insures tight closure. For more information about the *lasting* value of Aloyco Stainless Steel Valves in the handling of corrosive fluids—write today. Ask about the extraordinary range of alloys available to solve your particular problem. Alloy Steel Products Company, 1308 West Elizabeth Avenue, Linden, New Jersey.

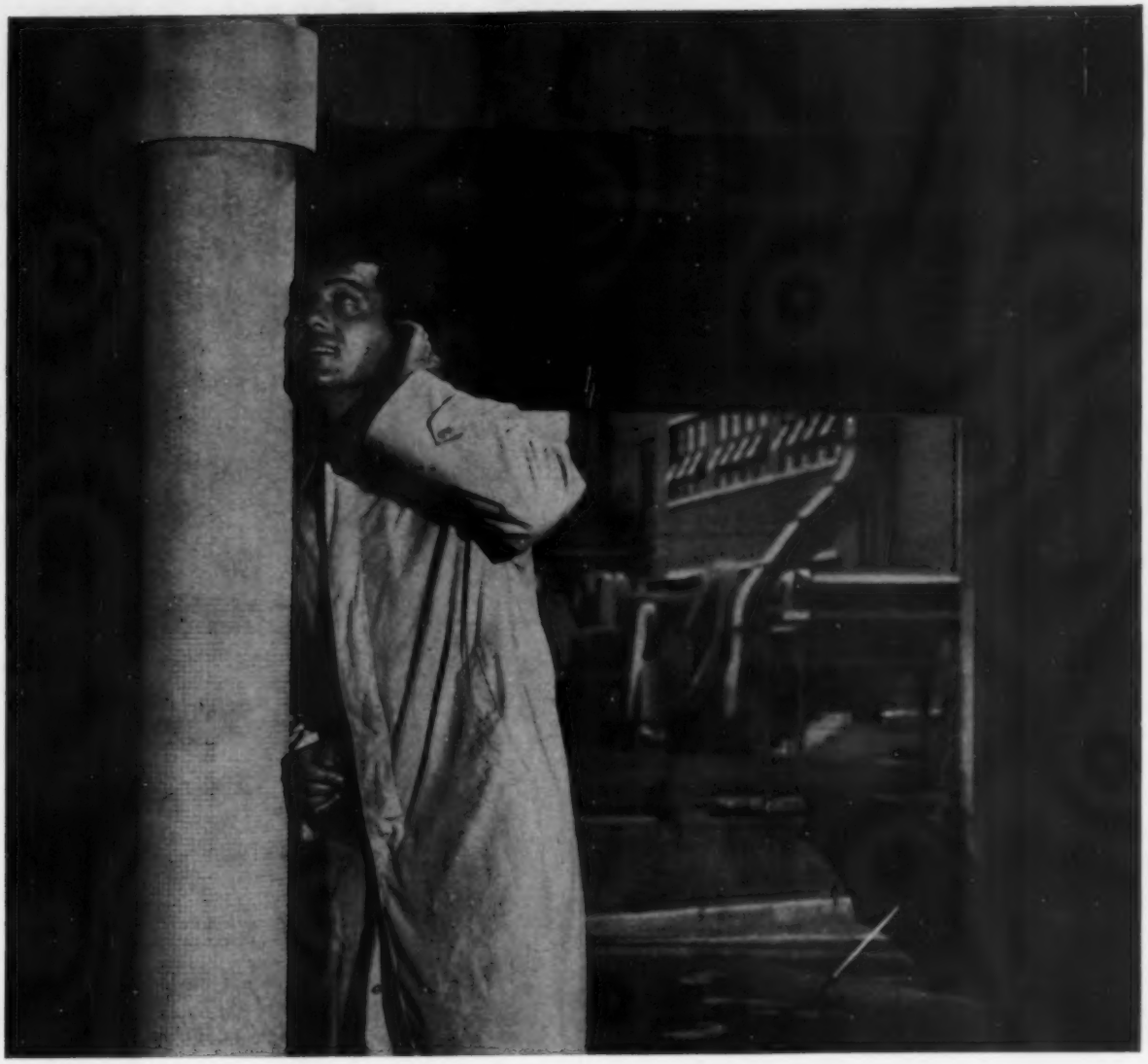
1-■

Subsidiary of

Longer Lasting ALOYCO VALVES

ALLOY STEEL PRODUCTS COMPANY

Circle 680 on postcard, page 33



Now! A "fast-flow" storm water drainage system that cuts installed costs up to 28%

With Johns-Manville Transite® Pipe, you can control the flow of rain water from roof level to outfall with a system that can be installed at a 28% reduction in cost.

First, Transite's material cost is substantially less than that of other quality materials previously used in this service. Secondly, the long lengths and light weight of this strong asbestos-cement pipe make for quick, sure installations, thus cutting labor time and costs. And, J-M's easy-to-install Ring-Tite® Coupling is a time-saver, too. It forms a tight joint that protects against leakage and the infiltration of ground water.

Over the years, Transite will continue to save you money. Its interior is made smooth to stay smooth, thus permitting rain water to be carried off at a maximum rate through minimum pipe sizes. You can just about forget maintenance problems, too! This non-metallic pipe cannot rust and resists corrosion inside, outside, and all the way through. For full details, send for Data Sheet TR-252. Write Johns-Manville, Box 362, PE-10, New York 16, N. Y. In Canada: Port Credit, Ontario. Cable address: Johnmanvil.

JOHNS-MANVILLE
TRANSITE PIPE

Circle 681 on postcard, page 33

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FLEXIBLE ABRASIVES

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Seat carbon brushes by touching to rotating commutator at brush heel, holding brush down. Released abrasive smoothes brushes, stopping damaging sparking. Also cleans small commutators and slip rings. Self cleans, won't scratch. 11 sizes in grades for all conditions.

For over 40 years IDEAL
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Circle 682 on postcard, page 33

DATA FILE

(Begins on page 270)

compressed, single- and two-stage compressors, piston displacement, control used. Ingersoll-Rand Co.

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To Speed Construction

Portable and tractor compressors designed to speed work and reduce construction costs are described in illustrated 8-pp Bulletin CG-15. Pneumatic air tools for use with portable compressors are shown. Le Roi Div., Westinghouse Air Brake Co.

For a copy, circle 367 on Post Card

WIRE ROPE, CHAINS, SLINGS

Sling Reference Handbook

Forty-pp Form SL-3 covers more than 80 subjects on slings and fittings. Included in this revised edition is reference information in handy chart form on sling types, dimensions, loads. Union Wire Rope Co.

For a copy, circle 369 on Post Card

Sling Chain Handbook

Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains. Contains diagrams, charts and tables on standard and special styles of sling chains. Columbus McKinnon Corp.

For a copy, circle 370 on Post Card

Data on Sling Chain Assemblies

Bulletin CSA gives information on "customized" components for assembling sling assemblies to suit requirements. Tells how to make a chain assembly and provides a chart giving load limits. Campbell Chain Co.

For a copy, circle 371 on Post Card

VALVES, TRAPS, PIPING AND FITTINGS

Stainless Steel Valves

Catalog 59SS, 32 pp, on stainless steel valves, illustrates design and construction features. Details advantages in withstanding corrosive atmospheres. Jenkins Bros.

For a copy, circle 372 on Post Card

Butterfly Valves

Circular 615-MF describes and illustrates butterfly valves, SP 150 psi, available for a variety of applications in connection with chilled water air conditioning systems and plumbing piping for temperatures not in excess of 200 F. The Lunkenheimer Co.

For a copy, circle 373 on Post Card

Corrosion Resistant Valves

Described in Bulletin 10 are valves made of Hastelloy Alloy B, C and D for resistance to corrosion by hot solutions of mineral acids. Tables list chemical composition and properties. Alloy Steel Products Co.

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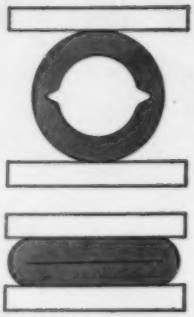
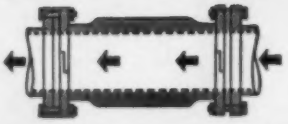
Massco-Grigsby PINCH VALVES

"Hinged" sleeve permits tight closing reduces wear.



Recesses in sleeve serve as "hinges" during compression.



Unobstructed flow eliminates high friction loss; and there are no metal parts in contact with pulp or liquid.

Several types of closing mechanisms are available, from handwheel to motorized.

Automated Systems.
Completely automatic systems may be coordinated and interlocked with other plant equipment.

1" to 14" I.D.; pressures to 150 psi; temperatures to 200° F.

WRITE FOR CATALOG 609

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OFFICES AND AGENTS IN PRINCIPAL CITIES

Circle 683 on postcard, page 33

Even When Caked with Concrete Dust...This Starter Gives More Life Than You'll Ever Need

This photo of General Electric magnetic starters operating a conveyor in a concrete block making plant helps prove one important point: General Electric starters will give *more life than you'll ever need* for almost any application! Some of the reasons? Contacts are slanted so dust slides off. Horizontal wedge action reduces impact, vibration, wear, and contact bounce. Unique magnet design gives positive pick-up and clean dropout every time. Molded coil resists dust, oil, water, mechanical abuse. But the best proof is *your own test* of the MEASURABLE ADVANTAGES of General Electric starters. Call your G-E sales engineer or distributor today. Or write for GEA-7020. General Electric Co., Section 813-32, Schenectady, N. Y.

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Circle 684 on postcard, page 33

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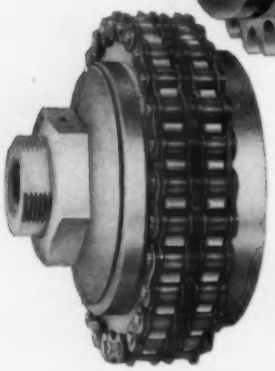
DALTON OVERLOAD SAFETY DEVICES

Prevent breakdowns due to jamming

MODEL "OSD" BASIC OVERLOAD SAFETY UNIT



MODEL "OSDC" OVERLOAD SAFETY COUPLING

Dalton Overload Safety Devices are torque-limiting units that prevent costly breakdowns and excessive wear of equipment due to overloading by automatically disengaging when a set maximum load is reached. They are reengaged automatically when the overload is eliminated. The devices are easily adjusted with a torque wrench to a specific maximum torque load.

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DALTON CAN SUPPLY ALL YOUR PRODUCTION GEAR AND SPROCKET NEEDS. SEND FOR QUOTATIONS.

Circle 685 on postcard, page 33

DATA FILE

(Begins on page 270)

Improved Butterfly Valves

Resilient-seated butterfly valves for applications where positive tight closure counts are illustrated in Bulletin 590X. W. S. Rockwell Co.

For a copy, circle 375 on Post Card

Air Control Products

Described in 16-pp bulletin Form A-320 are air cylinders and air control valves, including solenoid and manual valves. A. Schrader's Son.

For a copy, circle 376 on Post Card

Pinch Valves

Construction features of Masseo-Grigsby pinch valves are explained and illustrated in 14-pp Catalog 609. Provides sleeve service recommendations and specifications for manual, motorized, hydraulic types. Mine and Smelter Supply Co.

For a copy, circle 377 on Post Card

Data on Diaphragm Valves

Applications and advantages of diaphragm valves designed to overcome problems of corrosion, abrasion, contamination, clogging, leakage and valve maintenance are detailed in 48-pp Catalog sv-60. Operation details are illustrated, typical materials handled are listed. Grinnell Co., Inc.

For a copy, circle 378 on Post Card

Globe and Angle Valves

Described in Form 188 are full-flow bronze globe and angle valves featuring full area seat opening and accurate throttling control. Tables of dimensions. The Wm. Powell Co.

For a copy, circle 379 on Post Card

Direct Operated Solenoid Valves

Described in 12-pp Bulletin V-7 are solenoid valves for automatic or remote flow control of liquids and steam to 400 F and of high viscosity liquids. Schematic diagrams of valve operation are included, also sizes and capacities. The Johnson Corp.

For a copy, circle 380 on Post Card

Non-Lubricated Plug Valves

Features and advantages of non-lubricated plug valves designed to provide tight-resilient seal and give maximum resistance are detailed in Bulletin AE-1061. Selection tables are included. W-K-M Div., ACF Industries.

For a copy, circle 381 on Post Card

Plumbing, Heating Specialties

Protection and control specialties are illustrated in 12-pp Condensed Catalog C-60. Describes automatic temperature and pressure relief valves, temperature relief valves, gas shutoff valves, others. Watts Regulator Co.

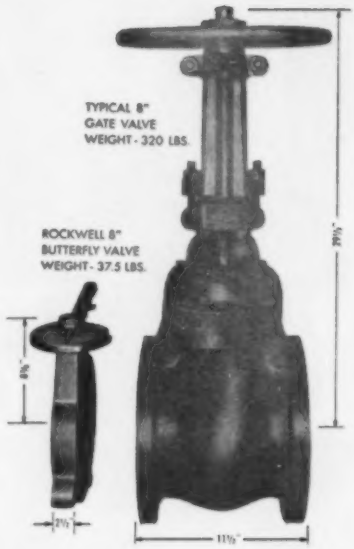
For a copy, circle 382 on Post Card

Steam Trap Fundamentals

Facts on drainage and steam trap operation are presented in this 16-pp primer. Data on trap maintenance included. Barnes & Jones, Inc.

For a copy, circle 383 on Post Card

Compare them
✓ for Weight
✓ for Space



This Rockwell resilient-seated wafer butterfly valve and the large gate valve are both 8" pipe size. Both do the same job. But what a difference in weight, space—and cost.

What does this mean? It means a 60 to 80 per cent reduction in weight in favor of the butterfly valve, depending on size.

As for space, the 8" butterfly valve requires but 8⅜" from center line of pipe for clearance, whereas the gate valve requires over 37" from center line for clearance, when the valve is open.

There are other advantages, too: A quarter turn opens and closes the butterfly valve. The gate valve, however, requires many turns. And operation is easier; maintenance is lower.

Fact-packed Bulletin 590X tells more. Write for it.

W. S. ROCKWELL COMPANY
2920 Eliot St. • Fairfield, Conn.

Made and sold in Europe by
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Circle 686 on postcard, page 33

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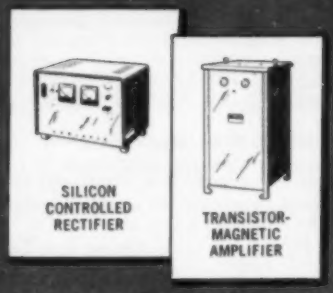
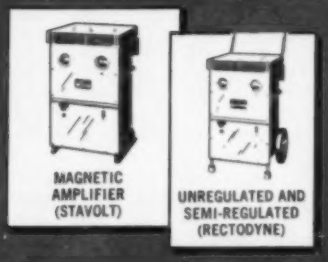
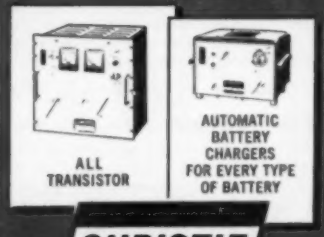
Up to 1500 Amperes

Over 200
Rectifier Power Supplies
Automatic Battery Chargers
in these 6 Types







CHRISTIE

Write for Complete Information

CHRISTIE ELECTRIC CORP.

3412G West 67th Street
Los Angeles 43, California

Circle 687 on postcard, page 33

Steam Traps, Regulators

This 12-pp condensed catalog contains technical and capacity data on steam traps, temperature regulators and heating specialties. Cutaway views included. Sarco Co., Inc.

For a copy, circle 384 on Post Card

Engineering Manual on Traps

This 40-pp manual is designed to assist in the sizing, specifying and selection of steam traps and other fluid specialties. Includes steam trap selection guide with explanation of four basic types of traps and how they perform. The V. D. Anderson Co.

For a copy, circle 385 on Post Card

Rigid Plastic Pipe

Bulletin HT-100, 6 pp, describes a rigid plastic pipe for high temperatures, pressures. Pictures typical applications and provides installation information. Carlton Products Corp.

For a copy, circle 386 on Post Card

Transite Pressure Pipe Guide

Twenty-four-pp Bulletin TR-62A contains detailed information on handling and installation of Transite pipe, from loading and unloading to backfilling and tamping. Johns-Manville Corp.

For a copy, circle 387 on Post Card

Pipe Dimensions Charted

This chart shows OD and wall thickness for ⅛- through 42-in. pipe. Includes information from ASA Standard B36.10 showing IPS and schedule number and their relationship. Midwest Piping Div., Crane Co.

For a copy, circle 388 on Post Card

How to Make Ends Meet

Catalog-Manual 60, 34 pp, presents a simple and efficient method of installing pipe. Coupling fittings and tools utilized are detailed. Shows how method is adaptable to various pipe. Victaulic Co. of America.

For a copy, circle 389 on Post Card

Expansion Joints

Twelve-pp Bulletin EJ-1917 describes advantages of Gun-Pakt expansion joints with either welding or flanged ends. Sections on figuring expansion of pipe line, expansion joint installation. Yarnall-Waring Co.

For a copy, circle 390 on Post Card

Unions, Valves, Fittings

Ring-bound Catalog U-601 provides detailed literature on unions, valves and fittings of forged steel. Lists popular unions with their technical ratings, details of construction. Clayton Mark & Co.

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Swivel Joints

Detailed information on swivel joints for many applications is presented in 24-pp Bulletin G-5. Basic types and applications are covered and specifications included. Chiksan Co.

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Quick-Connective Couplings

Catalog 100 contains data sheets detailing quick-connective fluid-line couplings for pneumatic, hydraulic,

Specify
WILKERSON "WHIRLFLO"
compressed air line
FILTERS

POSITIVELY removes damaging
OIL, WATER & DIRT
as small as 3 microns.

The "WHIRLFLO'S" double-barreled action meets maximum requirements.

1 Centrifugal force from special baffle vane sends contaminants to walls of cylinder away from cartridge, from where they drain into sump.

2 Then separated air flows through "Micro-Pruf" cartridge. This 2 stage action cleans better and adds months of life to cartridge.

SPECIFICATIONS
- ¼" to 5" NPT w/or w/o pipe flanges.
- Up to 1600 CFM w/low pressure drop.
- Maximum pressure 250 PSI
- Metal or transparent bowl.
- "Micro-Pruf" cartridge lasts 4 times longer.
- Automatic petcock can be added —drains bowl when pressure is off.

Write for complete list of models, sizes, specifications and uses listed in Circular #1023, and for model number conversion chart of all manufacturers.

WRITE TODAY

WILKERSON CORPORATION

Dedicated to keeping the NEW in pNEUmatics

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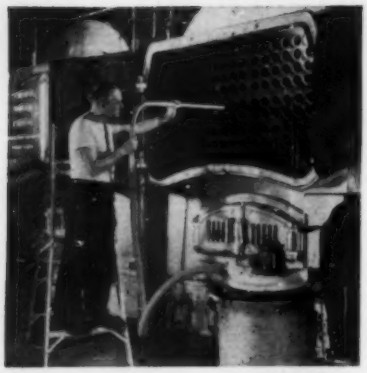
Circle 688 on postcard, page 33



There's a **gold mine** in YOUR Boiler Room!

The cost-cutting potential in the average boiler room will amaze you. It can constitute the difference between overall profit and no profit.

All fuels leave a soot residue in boiler tubes. ⅛" soot means almost half the fuel is being wasted, 1/32" a 9.5% fuel loss and ¼" a 75% loss. Tube cleaning is neglected because it has been a dirty, laborious job.

CLEAN — No soot scattered in boiler room, pushed into fire box or blown on operator with Super suction boiler tube cleaning equipment.

QUICK — All soot pulled into steel drum or container for once-and-all-disposal.

EASY — Anybody can do it without muss, fuss or hard work. Makes frequent, regular cleaning feasible.

SAVE — 9.5% to 75% of your fuel bill.

Your purchase of a Super Suction Heavy Duty Cleaner Model RS-1 or BP-2 with Super boiler cleaning tools will soon pay for itself and continue to pay generous dividends in fuel savings.

You also have the finest heavy duty suction cleaning machine built today, judged by any standards. Use it for general plant cleaning and in many production operations where powerful blowing or suction is required for removing dust, chips, recovering or transferring liquids.

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SALES AND SERVICE IN PRINCIPAL CITIES.

SUPER SUCTION / SUPER SERVICE

Circle 689 on postcard, page 33

DATA FILE

(Begins on page 270)

oxygen, acetylene, steam gases and liquids. The Hansen Mfg. Co.

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LUBRICATION

Organized Lubrication Benefits

Major cost control factors of organized lubrication are told in this 24-pp bulletin. Covers cost control opportunities, assigning responsibilities. Texaco, Inc.

For a copy, circle 395 on Post Card

Lubricating Manual

Function and properties of lubricants and selection of lubricants for lubricated plug valves are covered in this 12-pp manual. Lubricant selection chart included. Walworth Co.

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Heavy-Duty Lithium-Base Grease

Booklet SP-9489, 8 pp, describes a heavy-duty, multi-purpose lithium-base grease for use where loads are high, shock loads may occur, and where machine element action is oscilating. Gulf Oil Corp.

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Multi-Purpose Greases

Information on six Litholine greases is presented in this product bulletin. Sinclair Refining Co.

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Selection, Use of Lubricants

Characteristics, advantages of specialized fluid and grease type lubricants are given in 32-pp Data Book 59-2. Covers control of friction, use of grease type lubes, proper application, recommendations for various operating conditions. Lubri-plate Div., Fiske Brothers Refining Co.

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MAINTENANCE

Long Run Paint Economy

Paint selection factors are detailed in the sixth edition of "Engineered Color," 20 pp. Covers proper use of paint and color, requirements of various surfaces, color and the safety program. Describes interior and exterior primers, finishers, varnishes, etc. Barreled Sunlight Paint Co.

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Epoxy Chemical Resistant Enamel

Bulletin 1001 describes Corlar, an enamel for abnormal exposures to fumes, spillage and moisture. Covers characteristics, applications, coverage and preparation. E. I. du Pont de Nemours & Co., Inc.

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Rust, Corrosion Control

This 32-pp comprehensive treatise (Form 259) on protective coatings shows actual color standards of company's primers and top coating. Covers water-resistant, heat-resistance floor coatings, heavy-duty chemical resistant coatings, galvanized metal coatings, wire fence roller coatings and quick-dry types. Contains 110 color chips. Rust-Oleum Corp.

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Corrosion-Proofing for Industry

Bulletin 1-2 describes corrosion-proofing materials and services, including linings, coatings, flooring, acid-proof brick, reinforced plastic processing and ventilating equipment, cements, grout and adhesives. The Ceilcote Co.

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Corrosion-Resistant Coatings

Bulletin 100 tabulates protective coatings for corrosive classifications. Description and use of types of coatings, performance and application information, and chemical resistance ratings included. Carboline Co.

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Sanitary Wall Coating

Ceramic-like coating for use on cement, cement block, brick, plaster, wood and composition is described in this product bulletin, covering properties, advantages and application methods. The Master Mechanics Co.

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Vacuum Cleaning Equipment

Suction cleaning equipment for wet and dry dust and dirt removal is featured in a series of product bulletins. The National Super Service Co.

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Industrial Floor Machine

Described in Bulletin 81.5D is a self-propelling floor machine designed to remove grease-caked dirt from industrial floors in one operation. Operation details are illustrated. G. H. Tennant Co.

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SAFETY, PROTECTION

Fire-Resistant Fluids

This series of specification sheets on fire-resistant fluids covers synthetics, oil-in-water and water-in-oil emulsions, glycols. Mobil Oil Co., Inc.

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Sprinkler Branch Line Tester

Information and specifications on how sprinkler branch lines can be easily and periodically tested are presented in Catalog Sheet 151, Flow Test Procedure Form LT-100 and Sprinkler System Test Report. Seco Mfg. Inc.

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Signs for Industrial Safety

Catalog 11, 66 pp, illustrates signs for industrial accident prevention—danger, caution, directional, information and safety instruction signs. Prices given. Stonehouse Signs Inc.

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Electric Protection Services

Advantages of ADT central station protection service—holdup alarms,

STOP breakdowns due to loose nuts and bolts with

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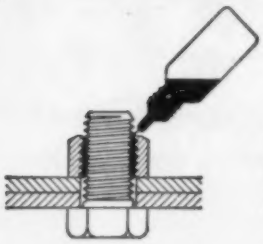

A single drop makes any nut a lock nut... any screw a lock screw

Liquid Loctite wicks into joint between nut and bolt. Hardens automatically. Holds so tight no vibration can shake it loose. Provides several times the strength of self-locking fasteners, yet is removable with ordinary tools.

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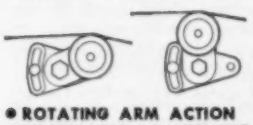
Circle 691 on postcard, page 33

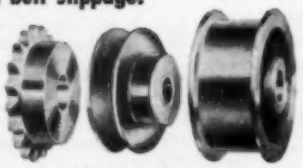
360° TAKE UP FOR CHAIN AND BELT DRIVES

Controlled tensioning eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage.



• ROTATING ARM ACTION FOR GREATER ADJUSTMENT
• FULL 360° POSITIONING

A low cost tensioner for single and multiple width drives that is more adaptable to machine frames. *See your Power Transmission Distributor* or write . . .



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18 SIZES
AVAILABLE FROM STOCK

BREWER MACHINE & GEAR CO.
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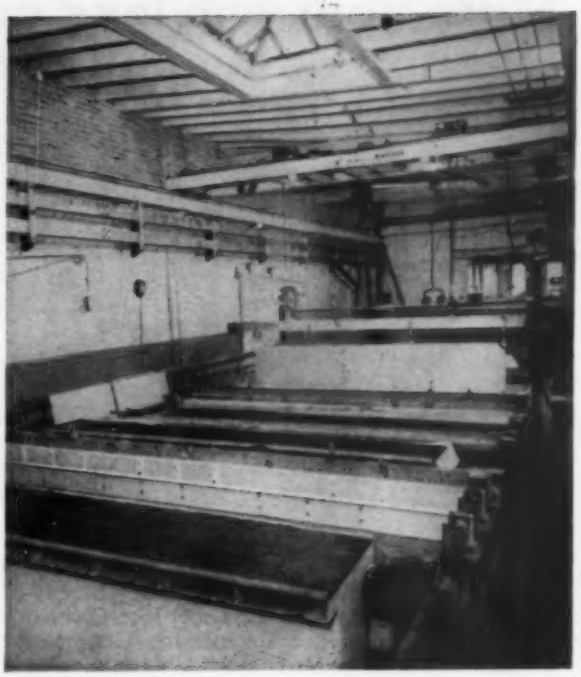

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YOU COULD SAVE $673

BY CHOOSING ALCOA ALUMINUM

The Alcoa® aluminum bus conductor used in this modernized Philadelphia plant* cost $673 less than copper bus with the same current-carrying capacity.

That's typical of the initial savings you can make with Alcoa aluminum bus.

But it's not all. You can handle aluminum easier, since it's only half as heavy as copper. You can cut and drill and bend aluminum bus easily. And aluminum will stand up well for many years under almost all conditions.

Before you make any decision on bus conductor, call your Rome Cable Division representative or refer to our Alcoa Aluminum Bus Conductor Handbook. In 270 pages it thoroughly covers the design and use of aluminum bus, in flat, round, tubular, channel, integral web, and sector bus shapes. Write to Rome Cable Division of Alcoa, Dept. 5-101, Rome, New York.

*Name furnished on request.

ALCOA
ROME CABLE
DIVISION

Circle 693 on postcard, page 33

More heat with less coal... cleanup costs cut 75% with

Users report actual proof that OXI Crystals have cut coal costs substantially, reduced firebox and boiler cleanup costs up to 75%! **OXI Crystals increase boiler efficiency** by getting rid of slag, firescale, encrusted carbon and soot *fast*. OXI oxidizes combustible deposits from firedoor to stack top. Get more heat and steam at less cost . . . write for complete information today! No obligation, of course.

Also ask about ***KOR****—world's most powerful fuel oil additive, and* ***SURFBLOW****—the floating boiler water skimmer.*

OXI CORPORATION 710 Box 485, Gary, Indiana

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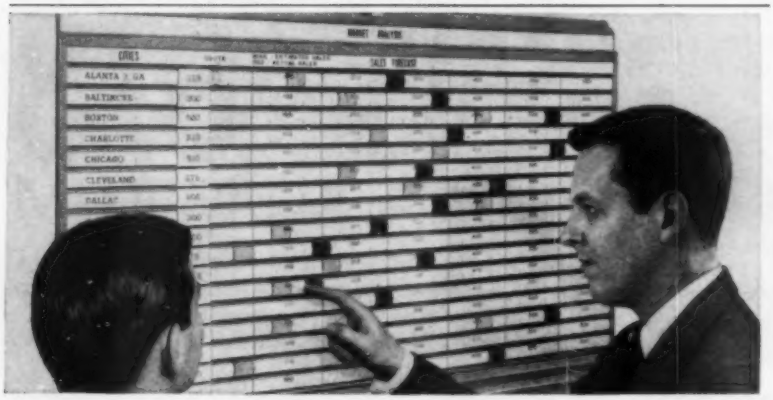

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Acme Control Panels adapt to your exact needs: Unlimited charting possibilities. Transparent colored signals flag due dates, reorder levels, quotas, goals. Signals slide smoothly . . . override or by-pass each other.

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Please give me colorful booklet on new Acme Visible Visual Control Panels and their many uses. I am interested in_____ _____type of record.

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COMPANY_____
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Circle 695 on postcard, page 33

DATA FILE

(Begins on page 270)

watchman supervision, burglar alarms, automatic and manual fire alarms, sprinkler supervision and waterflow alarms—are detailed in 40-pp Form 948-B. American District Telegraph Co.

For a copy, circle 411 on Post Card

ELECTRICAL

"Weatherized" Single-Phase Motors

Bulletin 470-B describes integral horsepower single-phase motors, ¾ to 20 hp, in open, protected, totally enclosed fan-cooled and explosion proof frames. Robbins & Myers, Inc.

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Transformers and Substations

Features and advantages of unit substations incorporating load center transformers and designed for close coupling with high and low voltage switchgear are detailed in 12-pp Bulletin 960. Sorgel Electric Co.

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Distribution Transformers

Dry type distribution transformers, single and three phase, are featured in 16-pp Bulletin 5A2-BL01. Wiring diagrams provided. Acme Electric Co.

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Controls for Heavy Duty Applications

Publication 6090 is a 20-pp guide to control units and stations for standard, heavy duty and oiltight heavy duty applications. Design features are illustrated and described, and applications, ratings, enclosures, modifications covered. Allen-Bradley Co.

For a copy, circle 415 on Post Card

Electrical Control Equipment

Eighty-pp Bulletin LO-11 features safety switches, service controls, load centers and accessories for electrical control equipment. Design and construction features, selection tables, case dimensions, and wire tables are included. Cutler-Hammer Inc.

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Color Selective Conversion Kits

Bulletin PL12-35 describes a color coding system for modifying standard relays to provide any number of circuit combinations. Color location diagrams indicate where various conversion kits can be applied on relay plates. The Clark Controller Co.

For a copy, circle 417 on Post Card

Guide to Fuse Economy

Described in Bulletin FB-1300 are fuses for complete circuit protection, including dual-element cartridge fuses, renewable cartridge fuses, one-time cartridge fuses, plug fuses, others. Federal Pacific Electric Co.

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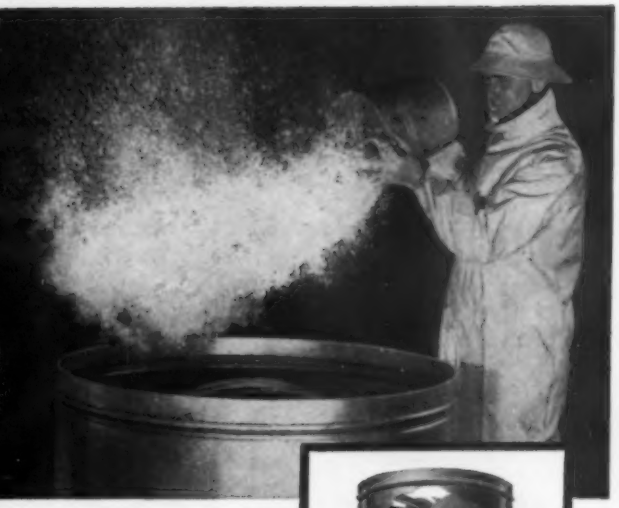
Fused Interrupter Switch

Eight-pp Bulletin PSGL features a fused interrupter switch designed to

RAIN CAN'T ENTER SKY-BLAST® ROOF VENTILATORS!



Powerful exhaust keeps out rain, snow, sleet. SKY-BLAST needs no throttling weather covers, so more air is moved at less cost. Wind velocity or direction can't affect performance. At rest, butterfly dampers form watertight seal. Other weatherproof features include: galvanized heavy gage steel surfaces . . . nonclogging rainshed . . . low wind guard . . . rugged base and condensate drain. Ratings to 78,000 CFM. Write for Bulletin 680-PE

R&M PROPELLAIR® Div. of ROBBINS & MYERS, INC., SPRINGFIELD, OHIO

DIRECT CONNECTED · TUBEAXIAL · EXTENDED SHAFT · MAN COOLER

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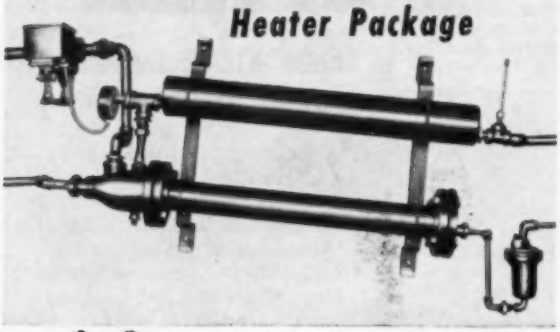
Johnson "Instant" Heater Package



Easy to install... just hang it on a wall

Here's a hot water source specially engineered for today's industrial plants. Hooks up to steam lines anywhere, produces hot water instantly on demand. No bulky, expensive storage tanks. No residual heat to cause scalding; holds maximum discharge temperature within 10° of setting. Johnson heater design achieves rapid, efficient heat transfer with only a few simple rugged parts — hooks right up to high pressure steam lines; no reducing valves needed. Capacities up to 900 gph. (for 100° rise) depending on steam supply pressure.

Write for full information

THE JOHNSON CORPORATION
822 Wood St., Three Rivers, Mich.

Circle 697 on postcard, page 33

G-K BOOTHS FOR INDUSTRY

- SPRAY BOOTHS, OVENS, WASHERS
- INDUSTRIAL FUME & DUST REMOVAL SYSTEMS
- INDUSTRIAL SHEET METAL FABRICATION

Versol Spray Booth for Cleaning Small Parts

Designers, Builders and Installers of Paint Spray, Grinding, Cleaning, and Metalizing Booths to handle any industrial process. Our booths are built to the exact specifications determined by our complete engineering analysis of your job requirements.

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Circle 698 on postcard, page 33

NEW MANAGEMENT TOOL CHECKS PRODUCTIVITY OF 40 MACHINES

Now progressive management can have a continuous and permanent check on 40 machines or processes at a central point. With the EAI Bar Chart Recorder you can determine actual machine productivity as well as standby, inoperative, or downtime. Other information can also be recorded. ■ *EAI Bar Chart Recorders have enabled alert managements to make substantial increases in output without increasing machine investment. Evaluations of plant layout, work schedules and equipment or process effectiveness have been greatly simplified. The recorder normally pays for itself many times over in the average plant in one year.* ■ *Typical applications include scheduling of computers and data processing equipment, office machines, machine tools, commercial laundry equipment, printing equipment, piece-part processing or manufacturing operations.* ■ *Write for information today on how this recorder can assist you in reducing your operating costs.*

EAI

ELECTRONIC ASSOCIATES, INC.
Long Branch, New Jersey

Circle 699 on postcard, page 33

DATA FILE

(Begins on page 270)

employ current-limiting and overload characteristics of dual-element fuses in low voltage feeders having capacities to 100,000 rms symmetrical amperes. Pennsylvania Transformer Div., McGraw-Edison Co.

For a copy, circle 419 on Post Card

Compact Capacitor Assembly

Engineering Bulletin 4900A describes a motor-start, motor-run capacitor assembly designed to meet requirements of air-conditioning equipment. Sprague Electric Co.

For a copy, circle 420 on Post Card

Plug-In Bus Duct Data

Bulletin XL-765, 32 pp, provides technical information, dimensions and layout procedures for a plug-in bus duct with low voltage drop characteristics and built-in safety features. Data on X100 bus duct and 100-amp plug-in duct is included. BullDog Electric Products Div.

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Multi-Purpose Cable

Details on a multi-purpose branch circuit and feeder cable designed for underground feeder service and for interior wiring where moisture and corrosive action are hazards are presented in Bulletin RCP-3002. Rome Cable Div., Alcoa.

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Data on Sheathed Cables

Construction details and performance information on sheathed cables, available in steel, copper, aluminum and bronze, are presented in Bulletin 1031, 16 pp. Engineering data included. Simplex Wire & Cable Co.

For a copy, circle 423 on Post Card

Electrical Equipment Digest

Presented in 168-pp Catalog Digest 143 are load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

For a copy, circle 424 on Post Card

Guide to Electrical Supplies

This catalog is divided into sections covering wire connectors, electricians' tools, electrical specialties, motor maintenance supplies, blowers and cleaners, wire strippers, soldering equipment. Ideal Industries, Inc.

For a copy, circle 425 on Post Card

Conduiets for Corrosive Locations

Sixteen-pp Bulletin 2699 discusses corrosion-resistant properties of metals and finishes utilized. Charts show applications. Also provides listings of Plast-A-Coat Conduiets for hazardous and non-hazardous locations. Crouse-Hinds Co.

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Explosion-Proof Wiring Devices

Bulletin H-1596 gives a technical description of explosion-proof devices

NO UPKEEP!

NEW ALL-ALUMINUM CHAIN LINK FENCE

No painting—virtually no upkeep! New high-strength alloys mean fencing that stands solid and handsome through the years!

Aluminum Chain Link is specified for more and more industrial plants, highways, parks, playgrounds...because you save so much on maintenance.

For more information call your Anchor Man. For free catalog write to Anchor Fence, Dept. PE 10, 6661 Eastern Ave., Baltimore 24, Maryland.

ANCHOR FENCE
made of
REYNOLDS ALUMINUM

Watch Reynolds exciting TV programs on NBC: the Dick Powell REYNOLDS ALUMINUM SHOW every other Tuesday; SAY WHEN, weekdays; ALL STAR GOLF—in living color—every Saturday.

Circle 700 on postcard, page 33

Markal
HEAT-PROOF COATINGS

Brush MARKAL Coating on piece of metal and apply direct flame of torch until metal is red hot. *Protective coating has not been impaired.*

MARKAL Coatings give you complete protection against steam, corrosion, scaling, oxidation at extreme heat—temperatures up to 2100°F.

Write for complete technical information and free sample . . . state work conditions.

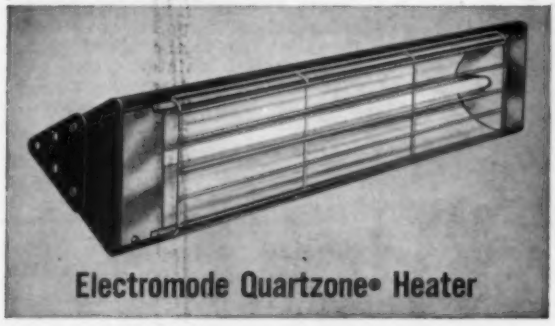
Markal COMPANY

3085 West Carroll Avenue • Chicago 12, Illinois

The Mark of Quality Protection—MARKAL!

Circle 701 on postcard, page 33

Now...Spot Electric Heating Indoors or Out



- **Infrared electric heating thoroughly covers selected area, indoors or out—warms people and objects, not the air. For watchmen, dock workers, etc.**
- **Quartz tube, even at red heat, withstands shock of rain, snow.**
- **Efficient aluminum reflector can be readily removed for cleaning.**
- **Select from 1000, 1500, 2000, 3000 or 4000 watts.**
- **Available in 120, 208, 240 or 480 volts.**

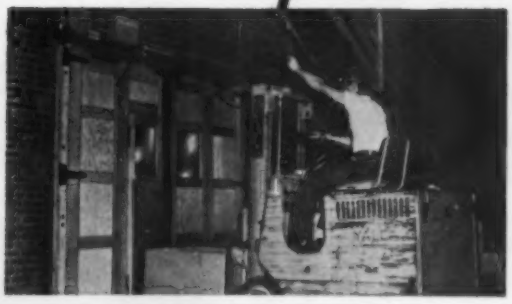
For more information, write:

Electromode

Dept. PE-101, 570 Culver Road, Rochester 3, New York

Circle 702 on postcard, page 33

ENDS BOTTLENECKS



The PREST-O-MATIC® Door takes the "STOP" out of "Stop and Go" traffic

Quick-acting PREST-O-MATIC works *for* you, not *against* you. Fully automatic, it prevents slow-downs and bottlenecks — saves you man hours aplenty.

Your fork truck driver simply pulls an overhead cord and goes through the opened door without stopping. The door opens and closes *Prest-O-Matically* in as little as 2 seconds. Compare this with manual doors that require your driver to stop, dismount, open the door, return to the truck, drive through . . . then stop to close the door again! Multiply this waste motion by the number of trips per day . . . per *year*.

Engineered to snug-fit your doorways, PREST-O-MATIC remains tightly closed when not in use. Neoprene Sealing stops drafts, eliminates heat loss.

Complete in one easy to install unit. No extras. Available in Bifold (shown here) and Sliding. You choose the motive power — air or electric. Before you buy any door, get all the facts on PREST-O-MATIC. See our insert in Sweet's Catalog or, better still, write us today.

CLARK DOOR COMPANY, INC. (since 1878)

507 Hunterdon St.
Newark 8, N. J.

Circle 703 on postcard, page 33

PUMP UNUSUAL LIQUIDS?

The liquids you pump or want to pump may present special problems. It's highly probable, however, that Viking Pump engineers may have worked out your problems before. During 50 years of pumping experience, we have handled thousands of problem applications—ranging from heavy, viscous liquids and semi-solids to highly volatile liquefied gases. This storehouse of data is available to you for the asking. And if you have a brand new problem, our experience and knowledge of Viking Pumps will help answer the new problem, too.

Viking's original "gear-within-a-gear" pumping principle is used today in over 1,000,000 genuine Viking rotary pumps. Many have given long-time service—20, 30 and even 40 years. They've had long pump life because we've always maintained high quality.

Note these facts: Sizes from ½ to 1050 G.P.M. Viscosities from .1 centipoise to 2,000,000 S.S.U. Fast, self-priming. Positive delivery. 100 P.S.I. non-lubricating liquids. 200 P.S.I. lubricating liquids. 500 P.S.I. hydraulic liquids.

Tell us about your unusual liquid pumping problem! And ask for Viking's 36-page Engineering Manual on Rotary Pumps, Catalog KZ.

VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, It's "Roto-King" Pumps

See our Catalog in Sweet's Plant Engineer's File

Circle 704 on postcard, page 33

this **UNIPAK®** can **INCREASE YOUR ELECTRICAL CAPACITY BY 20%**

It's no secret. It's one of Sprague Electric's power factor correction capacitors — proved in engineering principle . . . made by the world's largest capacitor manufacturer . . . listed by Underwriters' Laboratories . . . used by leading manufacturers the world over. Here's why—

Motors and similar equipment in your plant use both kilowatts (working current) and kilovars (magnetizing current). The kilowatts you buy from your electric company. The kilovars you can best supply yourself with Sprague power factor correction capacitors. And the more you supply, the greater your useful power, the less the load on present wiring, the lower your electric bill.

You can get a free estimate of potential savings in your plant, or literature giving more details by writing Sprague Electric Co., 487 Marshall Street, North Adams, Massachusetts. In Canada, write John R. Tilton Ltd., 51 McCormack St., Toronto 9, Ont.

SPRAGUE®
world's largest capacitor manufacturer

Circle 705 on postcard, page 33

DATA FILE

(Begins on page 270)

designed for industrial-commercial and hazardous installations. Harvey Hubbell, Inc.

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Inverted-Y Electrification

Aluminum inverted-Y conductor systems discussed in Form 2025A, 8 pp, are available for 500-1200 amp, continuous rating, 600-v for wall and ceiling mounting in dry places. The Cleveland Crane & Engineering Co.

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Industrial Truck Batteries

Construction features and advantages of industrial truck batteries with silconic plate for longer battery life are detailed in 24-pp Bulletin GB-1567D. Includes curves showing discharge characteristics of battery types. Gould-National Batteries, Inc.

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Industrial Truck Batteries

A three dimensional die-cut in the center of 12-pp Bulletin IT-531 shows industrial truck battery construction. Catalog also gives mechanical and electrical specifications. C & D Batteries Div.

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Automatic Charge Control

Described in Bulletin Section 71.04A (Form 5092) is an automatic device interconnected with charging equipment and mounted on the charging panel for controlling recharge of lead-acid batteries. Covers charging methods and contactors. Exide Industrial Div.

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Power Equipment Maintenance

Manual D-62, 60 pp, gives useful information on methods and instruments for the maintenance of generators, motors and power equipment. High potential dielectric testing is discussed. Associated Research, Inc.

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FILTERING

Filters for Industry

Illustrated and described in this product bulletin are filters for many applications, including liquid filters, intake filters, pipe line filters, others. The Dollinger Corp.

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Protection for Compression Lines

Bulletin 118 tells how TR filters remove condensed moisture, oil and pipe scale from compressed air lines. R. P. Adams Co., Inc.

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Filtration Equipment

Eight-pp Bulletin GEO-506A describes filtration equipment for liquids and gases. Information is classified according to uses, operating pressures. Commercial Filters Corp.

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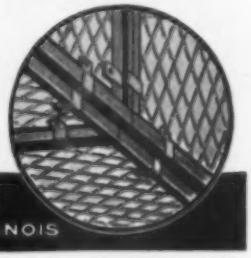

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Circle 706 on postcard, page 33

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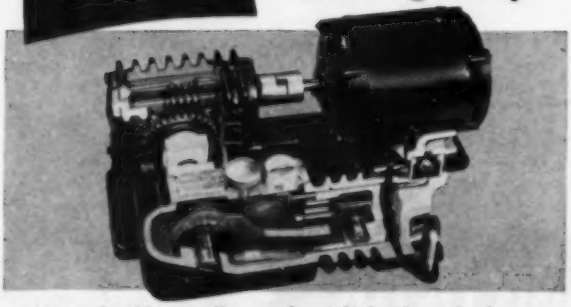

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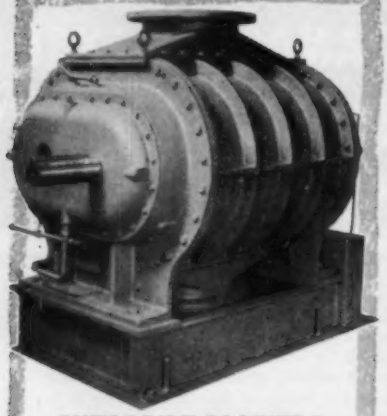

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DATA FILE

(Begins on page 270)

Replaceable Air Filters

Characteristics and applications of Micromat filter media for use in air conditioning, heating and ventilating are detailed in this product bulletin. Microtron Corp.

For a copy, circle 437 on Post Card

LIGHTING

Industrial Fixtures

This 1961 Catalog, 24 pp, describes lighting fixtures for commercial and industrial applications. Selection tables, industrial hangers and accessories. Day-Brite Lighting, Inc.

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Lighting Selector

This 24-pp lamp and lighting guide for plant and office lighting, tabulates recommended illumination levels, and tells how to obtain them with fluorescent, mercury or filament lamps. Graybar Electric Co., Inc.

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Vapor-Tight Light Fixtures

Aluminum fixtures in pendant, ceiling and bracket types for every type of installation are illustrated and described in this 48-pp bulletin. Selection tables giving dimensions, sizes, reflector types and other details included. Killark Electric Mfg. Co.

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Channel Type Lighting Supports

Eight-pp Bulletin G-2 describes channel type lighting supports for installing wiring and electrical lighting fixtures. Recommendations for applications, installation procedures, features, dimensional information included. Steel City Electric Co.

For a copy, circle 443 on Post Card

BOILERS

Self-Contained Steam Generators

Descriptive details and table of steam generator specifications for oil-fired, gasoline engine drive units are in Data Sheet C-1079. Clayton Mfg. Co.

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Packaged Steam Generator

Design and construction details and tables of capacities, dimensions and weights on a compact, portable shop-assembled water tube boiler with integrated firing equipment and controls are presented in 10-pp Bulletin PSG-3. Henry Vogt Machine Co.

For a copy, circle 445 on Post Card

Packaged Boilers

High temperature equipment for heating and process loads and package boilers are featured in Bulletin AD-167. Specifications, ratings included. Cleaver-Brooks Co.

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INSTRUMENTS, CONTROLS

Automatic Controls for Industry

Featured in this 92-pp catalog are automatic controls for commercial, industrial or processing plants. Specifications, diagrams, application data on electro-hydraulic valves and actuators, electric valve operators, air-operated proportioning valves included. General Controls Co.

For a copy, circle 447 on Post Card

Reader Service Cards for ordering catalogs are on pages 33 and 34.

For Pressure Measurement

Featured in 24-pp Catalog 2008 are U-type, well type and inclined tube manometers for measuring pressure of liquids and gases. Details operating principles and points to consider in selecting a manometer. King Engineering Corp.

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Temperature Control Center

Presented in this product bulletin is a control center combining such functions as data collection, motor control, alarms and communications for effective operation of building equipment controlling temperature, humidity, etc. Johnson Service Co.

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Circle 713 on postcard, page 33

DATA FILE

(Begins on page 270)

Meters, Regulators, Valves

Bulletin C-5000, 28 pp, describes gas, industrial, and water meters, gas pressure regulators and valves for a wide range of services. Application tips included. Rockwell Mfg. Co.

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Motion Analysis of Machines

White light Strobotac for tachometry and slow motion analysis of machines and processes is featured in 6-pp Form 3032-A. General Radio Co.

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Continuous On-Stream Analysis

Details on the Chemonitor, for on-stream analysis of critical constituents in water, given in 16-pp brochure. Hagan Chemicals & Controls, Inc.

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TOOLS, MACHINE SHOP

Electric Tool Guide

Portable electric tools and kits, including saws, sanders, drills, planes, routers, shapers, hammers, grinders and combination tools are illustrated in 30-pp Catalog 108. Prices given. Porter-Cable Machine Co.

For a copy, circle 453 on Post Card

Guide to Power Tools

Presented in this 68-pp catalog are electric and pneumatic tools for production, maintenance, construction, wood and metal working. Features worm drive and high speed saws; reciprocating saws; jig saws; hammers; planes, routers; sanders; drills; drivers; wrenches. Skil Corp.

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Industrial Power Tools

Data on power tools for construction, production and maintenance are presented in 38-pp Form 85. Covers drills, hole saws, magnetic drill presses, screwdrivers and accessories, impact wrenches, belt sanders, grinders, grinding wheels, saw blades. The Black & Decker Mfg. Co.

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Pipe Tool Guide

Application data on Ridgid pipe tools is provided in 16-pp Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises and others are illustrated. The Ridge Tool Co.

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Carbide-Tipped Bits for Masonry

Catalog MBC-56 describes masonry bits for drilling tile, brick, concrete, granite etc. Specifications are included and chuck, shank requirements for adapting to various hammers given. New England Carbide Tool Co., Inc.

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Industrial Wrenches, Hand Tools

Over 4000 items for production and maintenance are presented in 180-pp Catalog 60-1, including sockets and shanks for use on impact and nut setting wrenches, standard wrenches and tools, shop equipment, hydraulic pullers, electric drills, grinders, sanders, etc. Snap-On Tools Corp.

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Disposable Wipers

Applications of disposable wipers for general purpose wiping, cleaning and polishing are illustrated and described in 12-pp product bulletin. Kimberly-Clark Corp.

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INSULATION

Insulation for Industrial Equipment

This set of six specifications covers applications of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thickness of insulation to be applied, drawings in installation procedure. Pittsburgh Corning Corp.

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Flexible Foamed Plastic Insulation

Ultra*Foam pipe and sheet insulation for plumbing, heating, air conditioning, and processing is described in this product bulletin, along with data on temperature limitations and efficiencies. Gustin-Bacon Mfg. Co.

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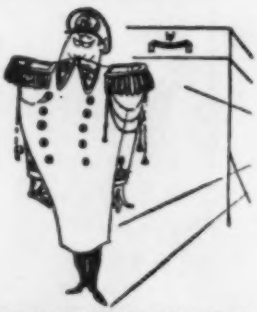

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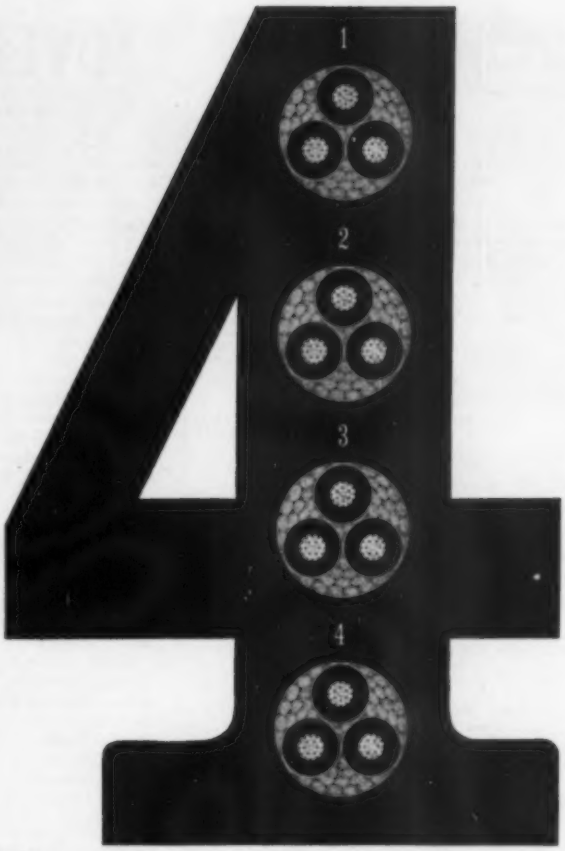

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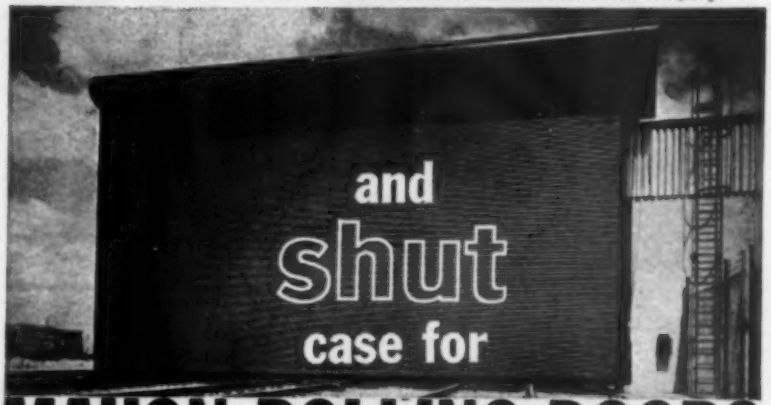
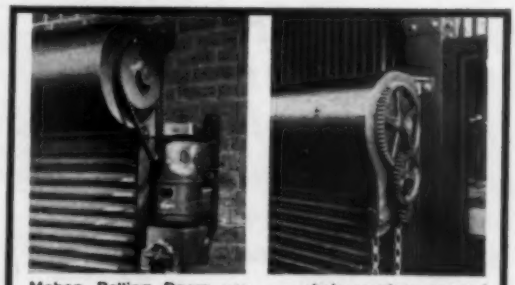
King-size (43-ft. wide, 22-ft., 7-in. high) Mahon Rolling Steel for a Detroit warehouse of Grand Trunk & Western Railroad. Contractor: F. H. Martin Construction Company.



MAHON ROLLING DOORS

Open: Mahon Rolling Doors are versatile space savers. **Shut:** they are sturdy protection. In between both stages, they are convenient, quick-acting, work and time savers. Mahon supplies Rolling Doors in standard or Underwriters' Labeled Types to suit your specific needs for new or old openings. All-metal construction with Bonderized slats insure long life, minimum maintenance. Whether you're building, modifying or replacing—investigate the multiple-benefit 'case' for Mahon Rolling Doors.



Mahon Rolling Doors are available in power-operated ... chain crank or manual types in all models.

MAHON COMPANY BUILDING PRODUCTS

- Aluminum or Steel Curtain Wall
- Rolling Steel Doors (Standard or Underwriters' labeled)
- Fire Walls (Underwriters' rated)
- M-Floors (Steel Cellular Sub-Floors)
- Long Span M-Deck (Cellular or Open Beam)
- Steel Roof Deck
- Acoustical and Troffer Forms
- Acoustical Metal Walls, Partitions, and Roof Deck

CONSTRUCTION SERVICES

- Structural Steel—Fabrication and Erection
- Steel Fabrication—Weldments
- Geodesic Domes—Fabrication and Erection

THE R. C. MAHON COMPANY *DETROIT 34, MICHIGAN*

MANUFACTURING PLANTS—Detroit, Michigan and Torrance, California
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REPRESENTATIVES IN ALL PRINCIPAL CITIES.

MAHON

WRITE FOR ROLLING DOOR CATALOG G-61—ALSO IN SWEET'S FILES.

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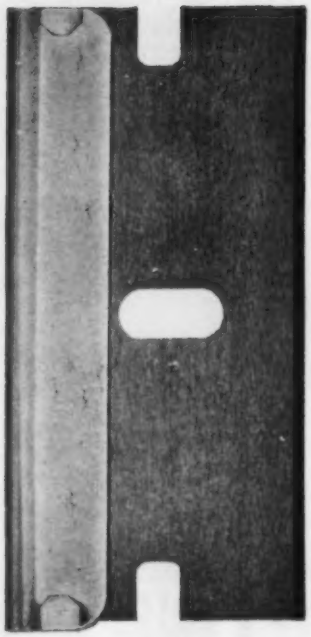

Shave heavy window replacement costs . . . use BARRETT plastic panels!

Fiberglass panels used for skylighting, side-lighting, or glazing give you a saving because they're shatterproof, resist chemicals, cut lighting bills, can be installed easily and maintained economically.

Offices in: Birmingham, Boston, Charlotte, Chicago, Cleveland, Houston, New York, Philadelphia, St. Paul.

BARRETT DIVISION
40 Rector Street, New York 6, N. Y.

Allied Chemical

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Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.

AGET Manufacturing Company
1388 Church St., Adrian, Michigan

DUSTKOP STOPS DUST

Circle 721 on postcard, page 33

1 man handles Sheet Steel Faster, Easier with a C-F LIFTER

C-F Lifters, under one man operation, pick up, carry and unload more sheet steel tonnage per hour than any other method – and at lower cost per ton. Wide carrying angles hold sheets securely – won't damage high grade sheets; tong action insures safe carrying; fast opening and closing adjustments of Lifter jaws permit shifting from one size pack to another in seconds. C-F Lifters are made in standard or semi-special models to handle from 2 to 60 tons.

Write for Bulletin SL-3? for specific examples of C-F Lifter operation and economy.

CULLEN-FRIESTEDT CO.
1317 South Kilbourn Avenue • Chicago 23, Illinois

Circle 722 on postcard, page 33

SPACE–
TIME–
MONEY–––

Save All Three with Square D QMB POWER PANELBOARDS

MOTOR STARTERS AND BREAKERS OR SWITCHES COMBINED IN ONE SPACE-SAVING PANELBOARD!

FACTORY-WIRED AND ASSEMBLED OR ENCLOSURES AND COMPONENTS AVAILABLE FROM YOUR SQUARE D DISTRIBUTOR!

BREAKER AND SWITCH UNITS ARE EXCLUSIVE PLUG-IN CONSTRUCTION. INSTALLED OR REARRANGED IN MINUTES!

If the above installation had been made the old way —with trough, and ganging separate switches and starters—it would have taken at least six feet of wall space instead of 30 inches, and four times the installation time.

After this panelboard is installed, Square D's exclusive *PLUG-IN* design permits circuit changes without costly down time. For extra safety, plug-in units are mounted directly above starters, permitting interlocking. No starter or disconnect door can be opened when switch is "ON."

QMB panelboards accommodate reversing or non-reversing starters, sizes 0 through 4; plug-in circuit breakers through 225 amperes; plug-in switches through 200 amperes (bolted through 600 amperes).

Twin Unit (above) available 15-100 amperes
Single Unit available 125-225 amperes

Exclusive Breaker Unit Advantages:

Plug-in construction • Each unit in individual steel enclosure with dead-front construction • Combine switch and breaker units in same panelboard, if desired

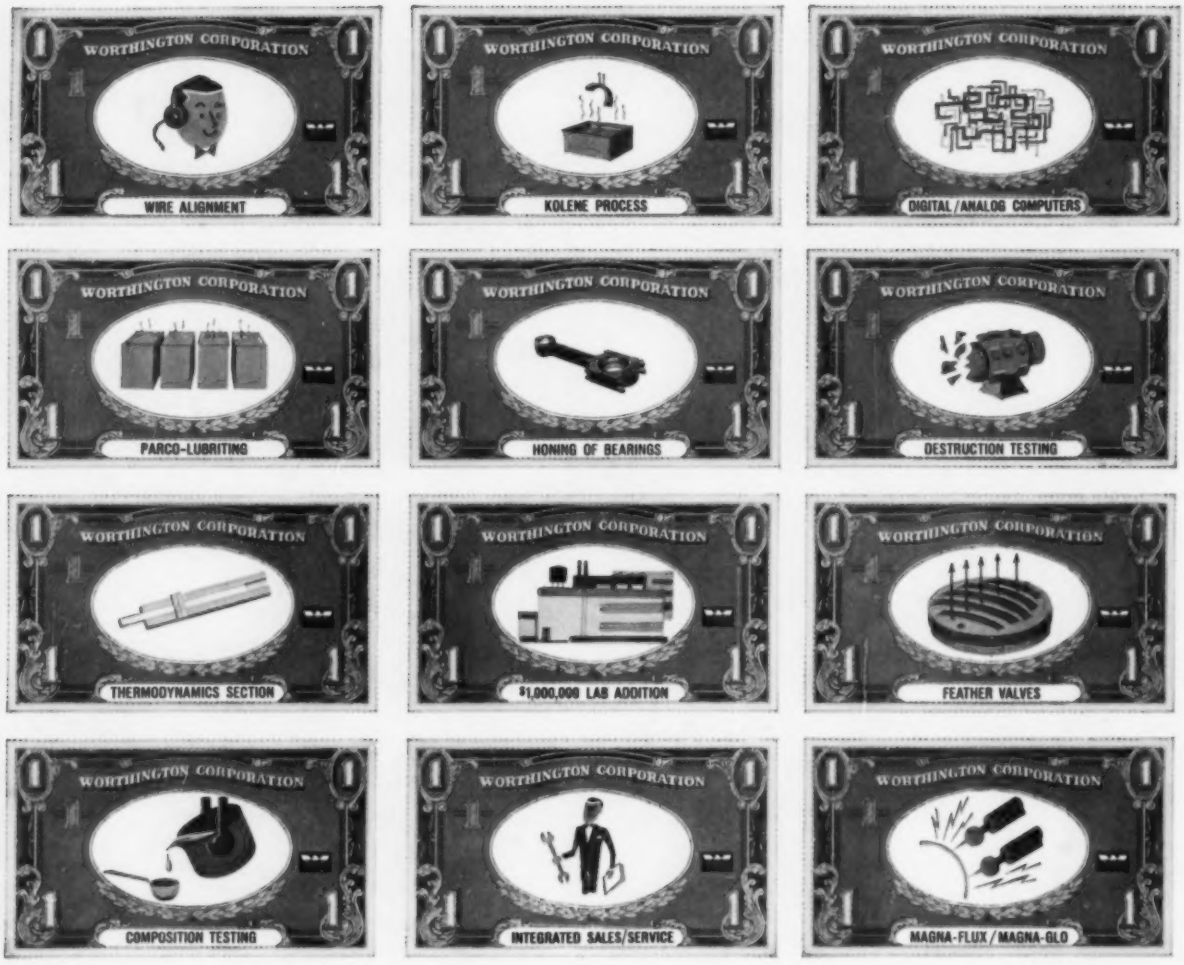
Write for the complete story—Square D Company, Mercer Road, Lexington, Kentucky

SQUARE D COMPANY

wherever electricity is distributed and controlled

Circle 723 on postcard, page 33

COMPRESSOR DOLLARS



WHAT'S IN THE PRICE?

These are dollars that are paid out every day for Worthington compressors. They reveal a few of the extra or "hidden values" that make the compressors worth most for the dollars invested. But even more important, they give a clue about real compressor values.

Today, rising costs and minimum profits compel every buyer to scrutinize compressor dollars more closely—to make sure they contain a full measure of value. In fact, your problem in determining the true value of a quotation is more difficult —but more important—than ever before.

What do we suggest? You must, of course, evaluate the price—dig for the "hidden values" buried in each manufacturer's offering with increased diligence. You can be sure that the values of prices will separate very quickly, because "hidden values" vary sharply in the compressor market today.

To help you isolate and evaluate competitive compressor offerings, we have prepared an objective "Compressor Evaluation Guide." This booklet points out the six key areas of judgment required for compressor evaluation and details them in full. Ask your Worthington Representative for this booklet or write Worthington Corporation, Dept. 36-18, Clinton Street and Roberts Avenue, Buffalo, N. Y. In Canada, Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

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